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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.

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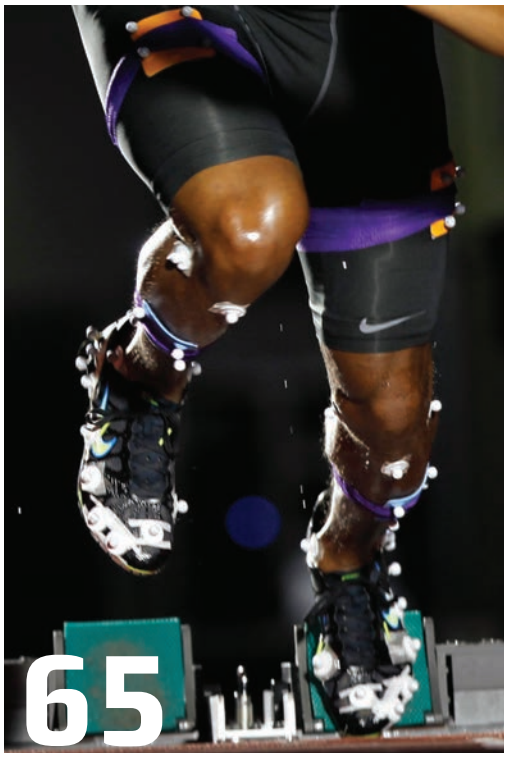
SUMMARY



When it comes to sports, there is no doubt that we have to engage with the theory of complex systems.
In this context, the obvious question concerns the possibility of constructing a mathematical model for the description and understanding of sports performance and the chance to make some sort of prediction of a sport performance.

The simplifying thought and the concept of complexity

The current issue of the EWF-SM contains an article, which, in addition to being extremely interesting from my point of view, is capable of triggering reflections on a new way of conceiving the organisation of training, based on an alternative vision of the human machine: in other words, its complexity. In the article, the concept of "complex" is explained perfectly, in its entirety, however, in this editorial, I would like to address the simplifying thought, in other words, the opposite of complexity.

The simplifying, or reductionist thought is the prevailing thought in the sporting world, and beyond. There is a continuous tendency to reduce various phenomena to a minimum, simplifying, for example, the application of the concept of training stress, often verifying feedback in a reductive manner and seldom, or rarely correlating the various phenomena measured individually.

Despite everything, many important sporting results have emerged, but the question I put to myself, and to you is: are we sure that we could not have done better if we had started off, not from a simplified concept, but rather through the vision of complexity?

What happened in terms of the philosophical structure, through the realisation and the vision of the simplifying or reductionist thought?

Reductionism is structured on four apparently solid pillars consisting of:

- **Order**
- **Separation**
- **Reduction**
- **Deductive-Inductive-Identity-making logic**

Let's take a closer look.

Order - The universe is governed by imperative laws. From the sovereignty of this pillar there derives a deterministic and mechanistic concept of the universe. This implies that everything in the universe is determined and can be determined. The Newtonian and Galilean thought which is typical of classical physics.

Separability - To solve a problem with this approach, we must break it down into simple elements. In doing so, however, we solve only part of the problem, never the entire problem, and never from its root. In addition, this approach has determined the separation between major sciences and the birth of disciplines, the estrangement of the object of awareness from the knower and finally, the (serious) separation of Science and Philosophy.

Reduction – This is based on the idea that the knowledge of the basic elements of the physical and biological worlds is a determined knowledge,

therefore, such elements would, in theory, be more measurable, whereas the knowledge of them as a changing and diverse set, would be secondary in this light.

Deductive- Inductive - Identity-making logic - This approach came into being with Aristotelian thought. In truth, it is a rather dated way of reaching a conclusion, a way which is characterised, in terms of approach, by the triad: I induce, I deduce, and I identify, in other words, operations that have had (and still have today) a total and complete application in their simplistic approach. Reasoning and theoretic construction come about logically by deduction and induction. This approach, to which we are undoubtedly in debt, but with respect to which we must also take a critical approach, excludes the qualitative transformations and the interactions between different forms of organisations.

Around the early 1900's, this approach, which had so far appeared steadfast, began to falter. The study and research method of the Infinitely Small was born and the organisation of the Infinitely Small showed from the very outset, a complexity of unexpected proportions. Quantum physics arose from this new approach, thanks to its supposed founder, Max Planck (1858 – 1947), who defined the concept of complexity as follows: "... the Universe maintains it rules which are very difficult to explain to the majority of individuals who often forgo scientific culture in its complexity, creating irrational yet seductive answers". The theory of Chaos was born alongside that of the Infinitely Small. The definition of Chaos is conceived in physics: a dynamic system is defined chaotic when it presents the following characteristics - Sensitivity and Unpredictability.

From this vision, it should be simple to deduce that also sport, because of its intrinsic characteristics, is a phenomenon which is subject to the law of chaos. Physicist, James Gleik defines the concept of chaos as follows: ..."*where chaos beings, classical science stops. For as long as the world has had physicists inquiring into the laws of nature (classical science), it has suffered a special ignorance about disorder in the atmosphere, in the turbulent sea, in the fluctuations of wildlife populations, in the oscillations of the heart and the brain. The irregular side of nature, the discontinuous and erratic side have been puzzles, or worse, monstrosities to science.*" However, they represented and continue to represent an inextricable truth!

In the 1940's, Moshe Feldenkrais (1904 – 1984), a physicist specialising in cybernetic engineering, began studying movement, creating a method (the Feldenkrais method), assessing it through the application of mathematical algorithms and attempting, in this way, to contextualise the phenomenon in terms of complexity. He deduced as follows: "*... life is complex, not only in its initial stages, it tends to evolve towards an increasingly complexity, which is an essential characteristic for its own continuity*".

Not only physics was interested in applied complexity. In 2001, the National Bioethics Committee addressed complexity as: "*...the latest era in the history of modern medicine has been characterised by an episteme marked by the discovery of complexity. It is a discovery that originates in 20th century philosophy and physics and that has produced awareness of the fact that the world as a whole, is not linear, but rather irregular, variable, unstable, precarious and uncertain, in short, COMPLEX.*"

In all this evolution, what has sport done regarding its approach to complexity? To tell the truth, not very much. We continue to study the phenomenon through the process of reductionism and simplification. We can rarely appreciate complex correlations that attempt to make an in-depth analysis of the origin of performance. Naturally, if sport were to change its point of view, complexity would inevitably force us to see things from another angle. But what would we see? In primis, **performance** through the collection and integrated study of the phenomena we know today. In order for performance to change, it will be necessary to adapt a new approach to **training**, which must start to study the phenomenon in a correlated, not reductive manner. Furthermore, in close keeping with the concept of reform and methods of training, things must change in terms of their r**esearch, functional assessment** and **application method**. But perhaps this is too complex?

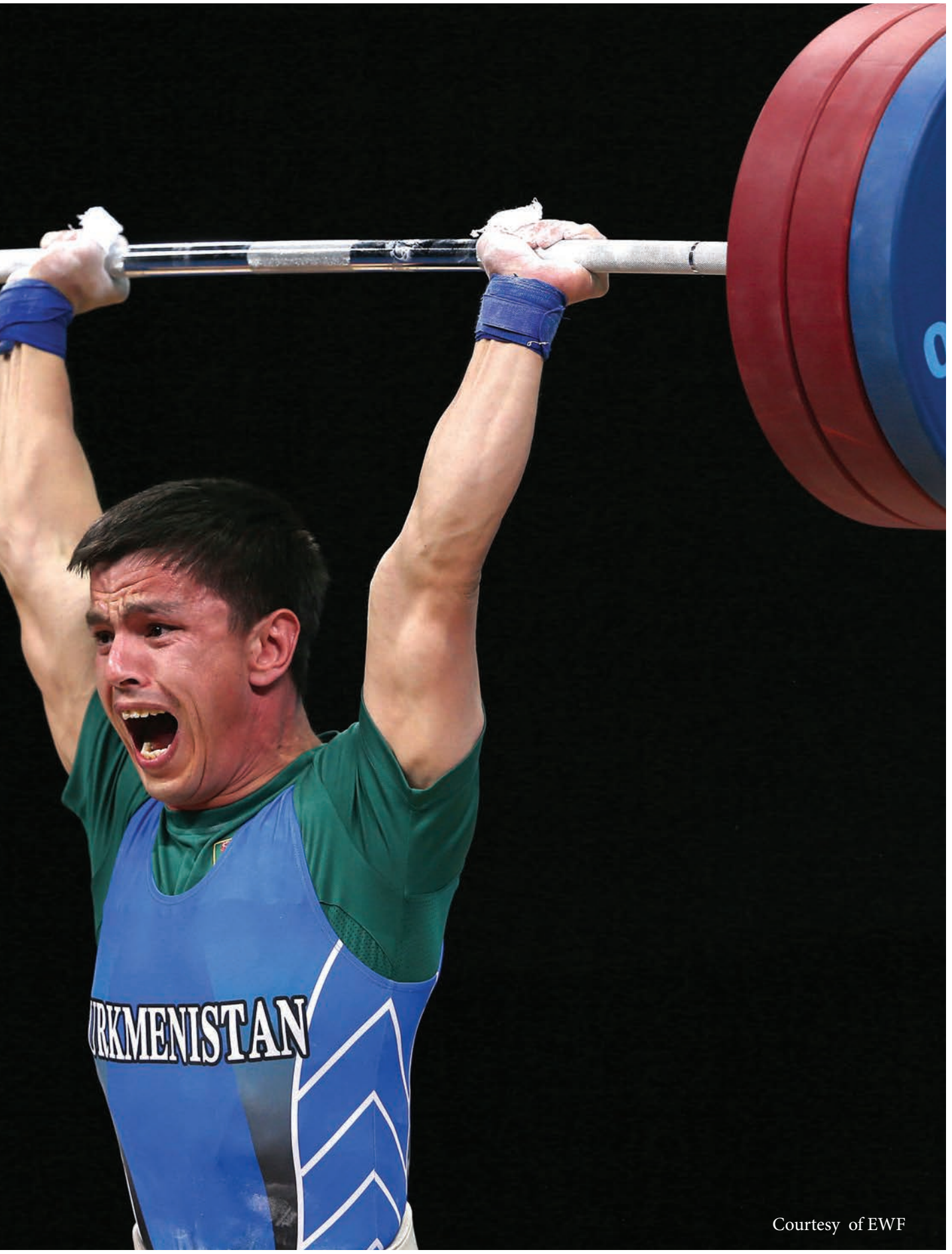
Antonio Urso
EWF President

The official journal of the European Weightlifting Federation

STRENGTH & CONDITIONING FOR A SCIENCE OF HUMAN MOVEMENT

MAXIMIZING ATHLETIC PERFORMANCE: OBSERVATIONS ON PERIODIZATION AND VARIATION

BY JAY R. HOFFMAN



Courtesy of EWF

ZIn the past half-century a number of studies have examined how manipulation of intensity and volume of training can influence improvements in strength and power. Early investigations focused on examining an optimal training intensity (i.e. load) that should be used to maximize strength gains (Berger, 1962; O'Shea, 1966). Subsequent studies though have suggested that when training intensity and volume are altered within a training cycle, that strength performance can be enhanced to a significantly greater extent than when these training variables are maintained consistent during the training period (Harris et al., 2000; Kraemer, 1997; Kraemer et al., 2003; Marx et al., 2001; Stone et al., 1982; 2000; Willoughby et al., 1993). The step-like alteration of training intensity and volume is commonly referred to as the traditional model of periodization (Baker et al., 1994; Hoffman, 2002; Rhea et al., 2002). It is also referred to as linear or block periodization in which each phase of the training program emphasizes a specific training goal (i.e., hypertrophy, strength or power) (Bartolomei et al., 2014). Linear or block periodization is typically characterized by an inverse relationship between intensity and volume of training. During the beginning of the training cycle training volume is high and training intensity is low. As the training cycle progresses training intensity will increase, while training volume declines. This is typical for the training program emphasizing increases in strength performance. However, for many athletes the goal may be to simultaneously emphasize both power and hypertrophy development. As a result alterations in daily program emphasis would provide the ability for athletes to train for both at the same time. This periodized training model is often referred to as nonlinear or an undulating training model (Hoffman, 2014; Kraemer, 1997).

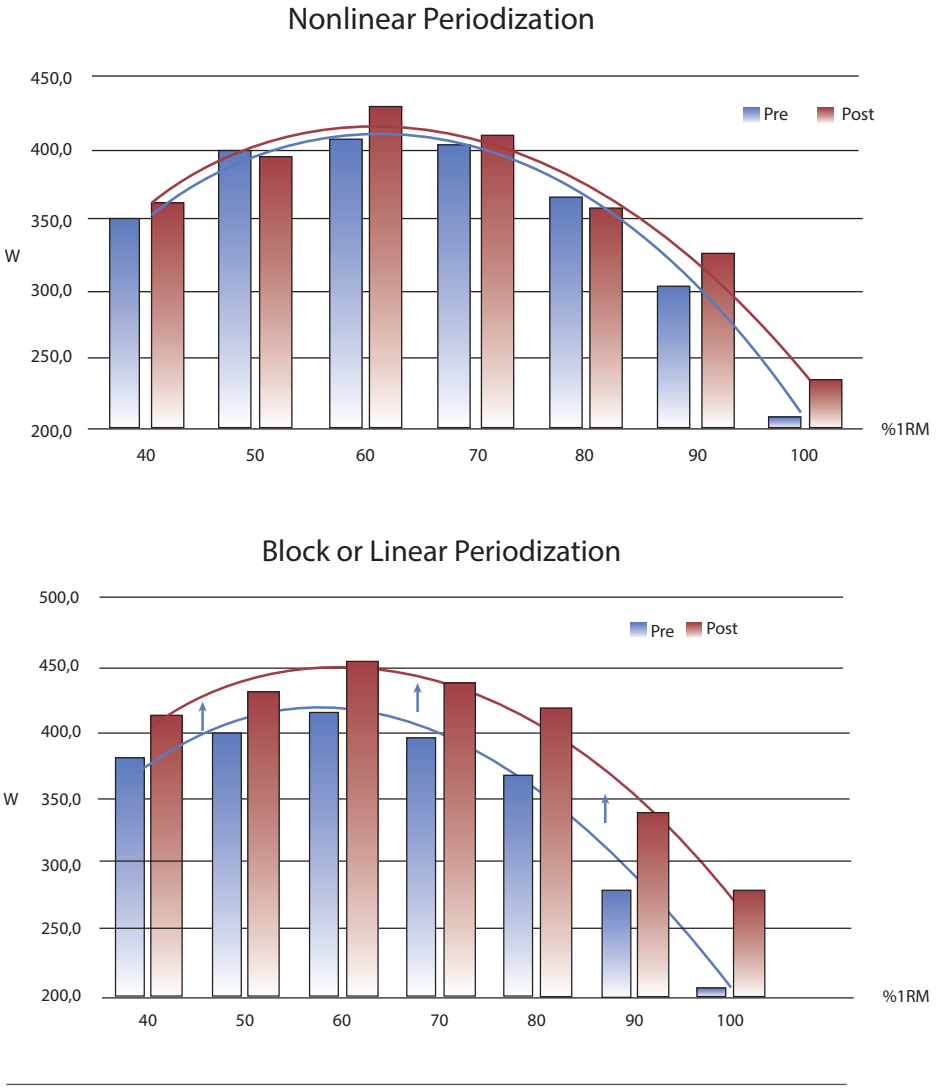


FIGURE NO. 1
COMPARISON IN FORCE/POWER CURVE CHANGES BETWEEN BLOCK/LINEAR AND NONLINEAR TRAINING MODEL. ADAPTED FROM BARTOLOMEI ET AL., 2014.

Studies examining nonlinear periodized training programs have demonstrated that daily program manipulation may be more beneficial in eliciting strength gains than non-periodized training (Kraemer, 1997; Kraemer et al., 2003; Marx et al., 2001; Rhea et al., 2002). However, comparisons between traditional linear and nonlinear periodization models are quite limited. It has been reported that a nonlinear periodized resistance training program was more effective in stimulating strength gains than linear periodization following 12 weeks of training (Rhea et al., 2002). In contrast, other investigators were unable to see any significant differences in strength gains between

these two periodization models following up to 9-weeks of training (Baker et al., 1994; Buford et al., 2007). However, the majority of studies examining the efficacy of periodized resistance training programs were not performed on competitive strength/power athletes. In the few studies examining competitive athletes, significant benefits of a nonlinear training model compared to no periodization have been reported in college tennis players (Kraemer et al., 2003) and American football players (Kraemer, 1997). However, these studies did not compare the non-linear periodization model to a linear periodization model. One of the few studies to examine linear versus non-linear training in competitive athletes was performed by Hoffman and colleagues (2008). They examined experienced, resistance trained American college football players during a 15-week offseason program. They randomly divided the team into a linear, nonlinear, or no-periodized training program during the study. The results were unable to demonstrate any clear evidence that one training program was more effective than the other. However, the investigators suggested that the results of the study were impacted by the prolonged active rest period (7 weeks) that had preceded the start of the study. It is likely that a longer period of training would be needed to delineate any differences between the training paradigms following prolonged periods of no training. A recent study followed up on that study and compared a block periodization scheme to an undulating type training program in which intensity and volume of training were altered each week for 15 weeks (Bartolomei et al., 2014). Subjects were competitive strength/power athletes. Results suggested that the block periodization model appeared to be more beneficial than the undulating model in enhancing upper body strength and power performance, but not in the lower body measures. However, the block or linear model appeared to cause an upward shift to the force/velocity curve and a greater power output at the lower intensity of the athlete's maximal strength capability in the bench press exercise *(see Figure 1)*.

The development of yearly training programs includes specific emphasis on inseason training regimens. The inseason program, also known as a maintenance program is designed to primarily maintain the gains made during the offseason training program. However, depending upon the training experience of the athlete or the design of the training program, it appears to be possible to improve these variables during a season of competition.

INSEASON TRAINING PROGRAMS

Studies examining the effect of inseason conditioning program have shown significant gains in both upper and lower body strength (one repetition maximum [1RM] bench press and Squat, respectively) in both competitive football (Hoffman and Kang, 2001) and basketball (Hoffman et al., 1991a) players. Although the primary goal of an inseason training program is to maintain the strength gains made in the offseason, these studies indicate that strength can be improved as well. Increases in strength in football players have been seen in the 1RM squat (Hoffman and Kang, 2001), while improvements in upper body strength have been reported in basketball players (Hoffman et al., 1991b). The differences between these studies are likely related to the demands of each sport. Basketball players emphasize lower body training during practice and games that may limit lower body strength improvements during the season. In contrast, the greater potential for lower body strength gains in American football players is likely related to the player's resistance training experience. Most American college football players in their initial season of college football have been resistance training for at least two years prior. However, we have found that many of these athletes had limited experience in the squat exercise. It is probable that the greatest window of adaptation in the younger (i.e, first year) players is in lower body strength attainment.

Improvements in strength during the season also appear to be related to the intensity of training used during the inseason resistance training program. When training intensity exceeds 80% of the players 1RM the ability to stimulate strength improvements is significantly greater than when training intensity is below 80% (Hoffman and Kang, 2001). This appears to be more prevalent in first year players than in the older, more experienced resistance trained athletes. It is

likely that the accumulated fatigue occurring in players that have greater playing time limit the extent of muscle adaptation occurring during the season.

A comparison of linear to nonlinear training has also been examined during an inseason training program. Hoffman and colleagues (2003) examining American freshman college football players reported that both linear and nonlinear models of training are able to maintain strength during the competitive football season in freshman college football players. Further, subjects performing the linear training program model showed significant improvements in 1-RM squat strength, while no significant strength changes were observed in subjects training with the nonlinear model of training.

The subjects in the nonlinear group were required to train at approximately 70% of their preseason 1RM during the first training session of the week, and use a resistance approximating 90% during the second training session. The subjects in the linear group were required to train at 80% of their 1RM during both weekly training sessions. Subjects in both groups were encouraged to aggressively increase the resistance used when they were able to complete the required number of repetitions for two straight training sessions. Examination of training logs at the end of the study showed that the average training intensity during the high intensity training day for subjects in the nonlinear group was less than 90% in both the squat and bench press exercises and greater than 75% on the light intensity training days. Although the average intensity of training per week was similar between the nonlinear and linear groups (80.75% and 83.95% in the squat exercise) and (81.3% and 83.3% in the bench press exercise), the subjects in linear training group were able to train at an intensity averaging better than 80% for both training sessions. Thus, it is likely that the subjects in the linear training group were provided a greater stimulus to elicit strength improvement compared to the subjects in the nonlinear training group.

TRAINING PROGRAM VARIATION DURING OFF-SEASON CONDITIONING PROGRAMS

The traditional power lifting program may not provide the optimal training stimulus in football players. When Olympic lifting exercises are added to the training program of these athletes we can enhance leg strength and running speed to a greater extent than power lifting exercises only (Hoffman et al., 2004). Although improvements in both upper and lower body strength measures were not significantly different between strength/power athletes using an Olympic exercise routine and a traditional power lifting training program, there did appear to be a trend toward specific strength adaptations that were related to the subjects' specific training program. Subjects in the power lifting group experienced a two-fold greater improvement in upper body strength ($p>0.05$), while the subjects in the Olympic lifting group experienced an 18% greater improvement in lower body strength ($p>0.05$). These differences in strength improvement were likely the result of the inclusion of specific assistance exercises that were part of the subjects' training programs. The greater number of assistance exercises of the upper body incorporated into the training program of the power lifting group likely impacted the strength gains of the upper body, while the greater number of multi-joint structural exercises utilizing the lower body musculature that comprised the training program of the athletes incorporating the Olympic exercises may have had a greater impact on lower body strength development. In addition, the high number of pul ling exercises (i.e. cleans, snatches and pulls) seen in the training program of the Olympic lifting group likely impacted the significantly greater vertical jump improvement seen in this group compared to the power lifting group. These exercises are mechanically similar to the vertical jump and the motor unit firing patterns that are improved during training of these exercises would likely enhance the firing pattern of these motor units during the vertical jump as well.

Training programs that involve high velocity movements, such as that seen with Olympic training, are thought to be superior for eliciting gains in power output and speed. This is based primarily on the high rates of force development and improved contractile speed associated with high force, high velocity resistance training. Although differences in sprint and agility performance was not stati-

stically significant, there did appear to be a tendency for a greater improvement in sprint times in the Olympic training group compared to power lifting group. The sprint and agility training program that was incorporated into the training program of both groups likely had a significant impact on speed and agility improvement in all subjects. Other studies have reported that combination training may be more effective than training programs that focus primarily on either high force or high power only (Harris et al., 2000; Wilson et al., 1993). Training programs of high force only appear to improve force at the high end of the force-velocity curve, while the inclusion of high power or high velocity exercises appears to emphasize greater improvements of force at the high velocity end (Hakkinen, 1994). A combination of high force and high power training would appear to result in adaptation occurring at a greater part of the force-velocity curve and have a greater impact on athletic performance (Hakkinen et al., 1986).

Recent research has indicated that the inclusion of ballistic exercises (i.e. jump squats and bench press throws) may further augment the training response in these players (Hoffman et al., 2005). In a study of experience, resistance trained strength/power athletes these investigators incorporated jump squat exercises into the 5-week strength/power phase of the offseason conditioning program. The jump squat exercise appeared to significantly enhance the strength performance in the squat and power clean exercises in those athletes performing the ballistic movements compared to those athletes that did not. However, no significant differences power performance was seen. It is likely that in a group of well-trained athletes a greater duration of training with ballistic exercise is needed to impact speed and agility performance.

This would be consistent with other studies that have demonstrated significantly greater improvements in power performance when ballistic exercises are incorporated into the training program (Newton et al., 1999: Wilson et al., 1993).

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Courtesy of EWF

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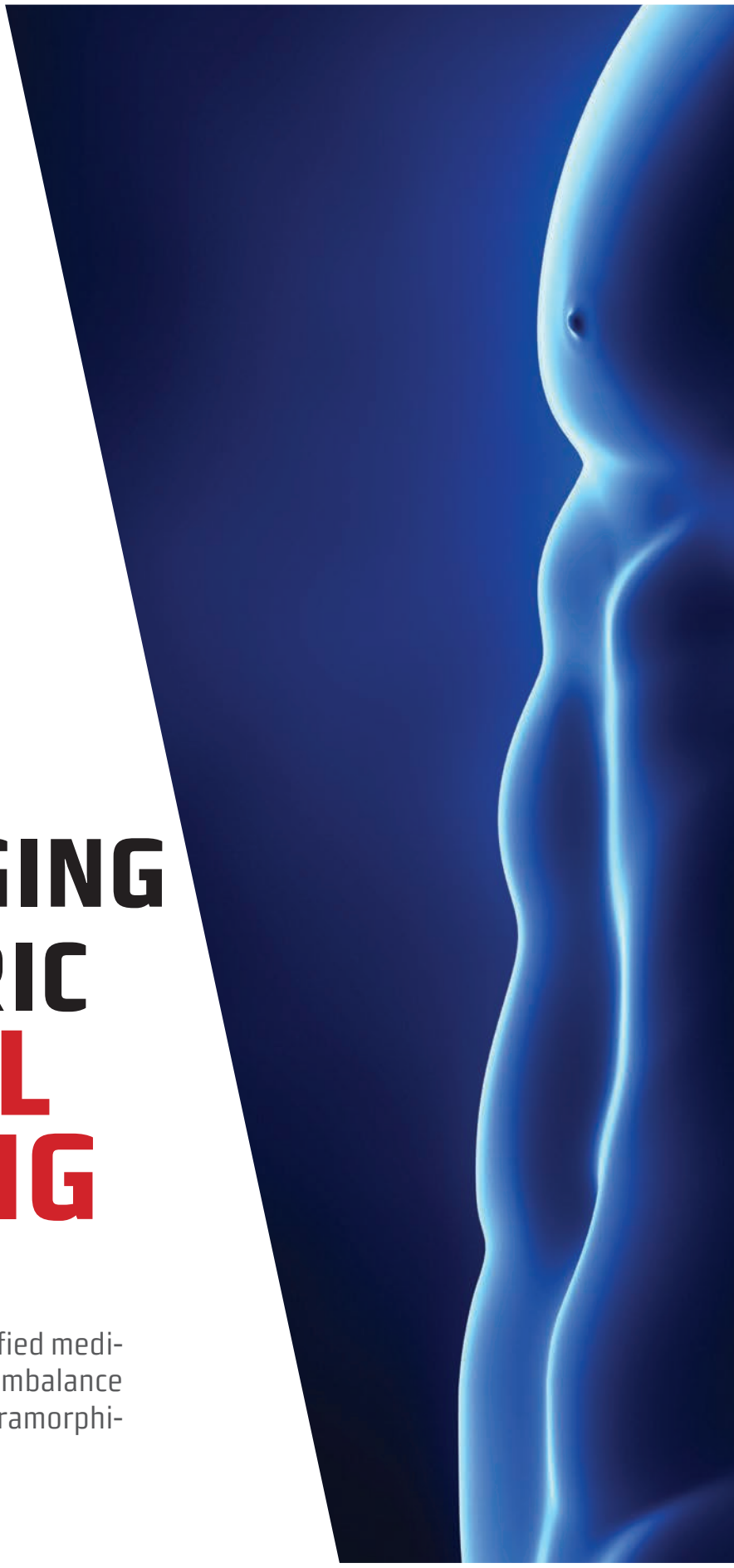
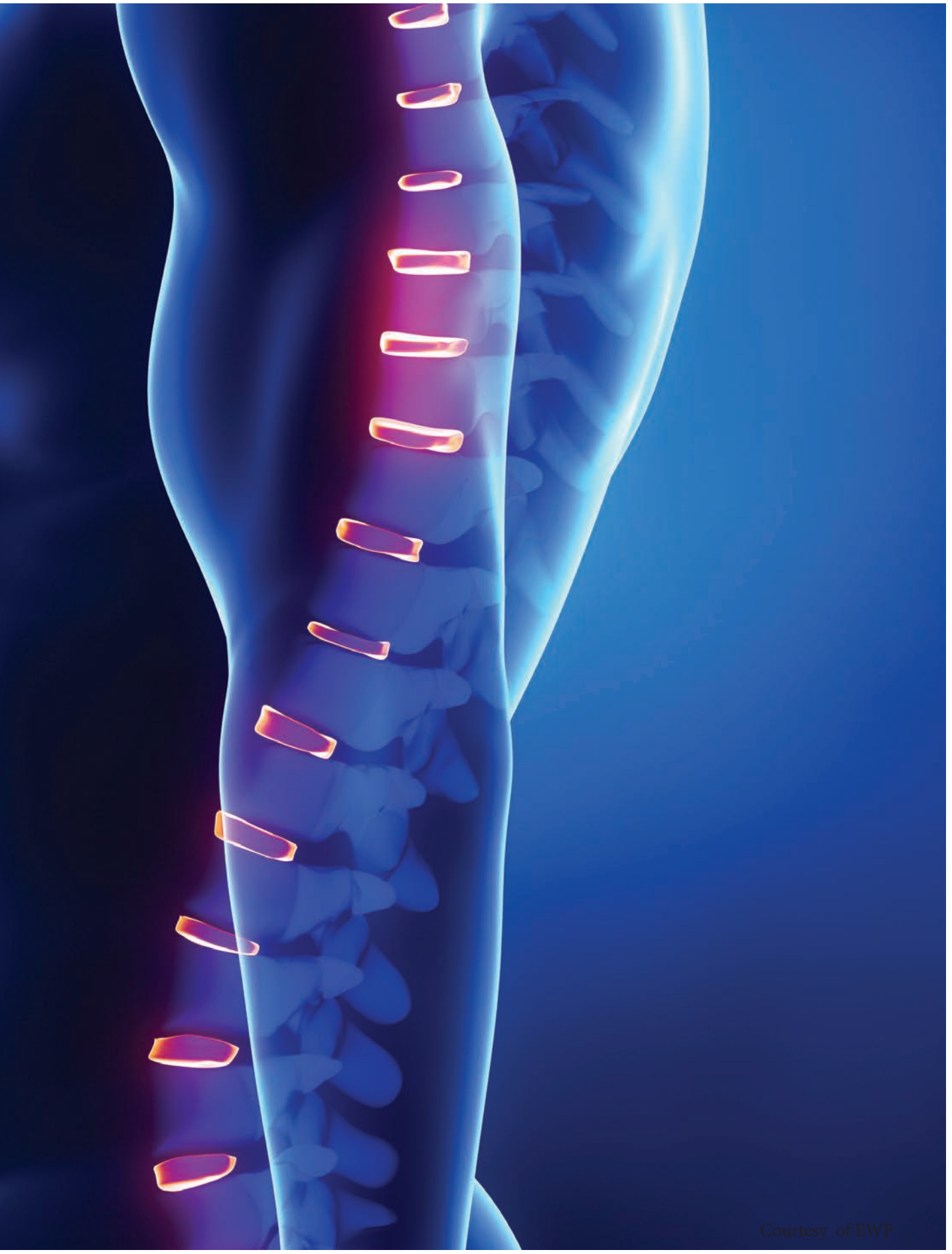


RECENT ADVANCES IN THE IMAGING OF BIOMETRIC POSTURAL SCREENING

The SpinalMeter is a patented and certified medical device which detects any postural imbalance of the spine, in particular structural paramorphisms and dysmorphisms.

BY STEFANO SABATINI



Courtesy of EWF

Every male or female athlete's One of the aspects that is rapidly and inexorably changing the traditional models of Sports Medicine's approach to the preparation of athletes and the training of their trainers, is the awareness that in order to bring an athlete to a professional level so as to compete on an international level, a range of professional figures must be capable of working together as a team and creating customised training programmes. A sophisticated medical staff must be on hand, coordinated by a specialist in Sports Medicine, and including an orthopaedist, a physiotherapist, a dietician, a psychologist and a posturologist.

Admittedly, the latter figure is not yet well defined on the international sports scene. Various specialists have traditionally been involved in postural screening: Orthopaedists, Paediatricians, Orthodontists, Dentists, Gnathologists, Psychologists, Orthoptists, in addition to the varied category of Physiotherapists, Chiropractors, massage therapists, Physical Education graduates, etc.

Presumably, the data provided by international organisations on the high percentage of the world's population who suffer or have suffered from problems relating to posture (estimated at over 60%) have led to an increase in specialists in postural screening.

If good posture is important for an individual who practices sport on an amateur level, correct posture for a professional athlete is essential; in fact, if an individual presenting significant paramorphisms or dysmorphisms undertakes a series of intense training sessions and competitions, we should be aware that he/she will most likely meet with injuries that will lead to the interruption of the competitive activity for long or short periods.

Having said this, we must ask ourselves: postural screening, is or is it not a simple act?

It most certainly is not simple. In actual fact, it is very complex also for the specialists involved and for the equally numerous schools of thought in the scientific world and beyond. What are the most common measurement devices?

Total body x-ray, the scoliometer, the gibbometer, the plumb line, the podoscope and the most important of all: the objective visit.

Recent advances in imaging in biometric postural screening, carried out by the medical division of Maestrale Information Technology, have marked a clear boundary between the past and the present and have opened new, previously inconceivable frontiers for the future. The introduction of digital technology, with the creation of two new medical measuring apparatus namely, the SpinalMeter and the CervicalMeter, allow specialists to acquire mathematical data and represent an epic transition from subjective measurement to objective biometric postural screening.

Thanks to this innovative digital technology, we now have a new diagnostic and multi-disciplinary approach to postural screening.

SPINALMETER

The SpinalMeter is a patented and certified medical device which detects any postural imbalance of the spine, in particular structural paramorphisms and dysmorphisms.

A high-definition system for screening and diagnostic purposes. Hypoallergenic markers are applied on the anatomical landmarks and a sequence of photographs is acquired which is then elaborated by sophisticated software using a mathematical formula. The result is a three dimensional image of the entire spine and the production of angular measurements (automatic calculation of Cobb angles) and their deviations, imbalances and postural changes. The exam is completely radiation-free and does not require any particular protection and/or screening for either the patients of the operators.

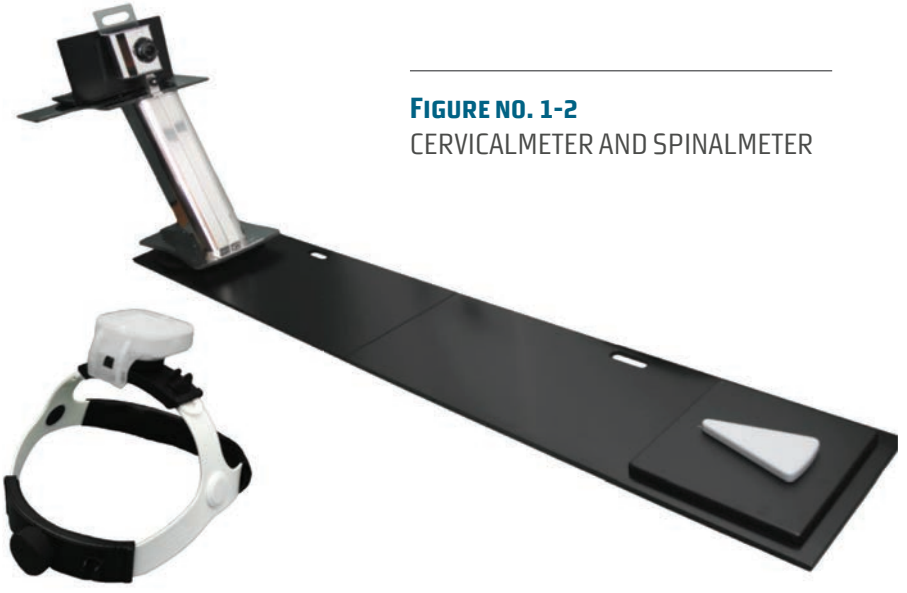
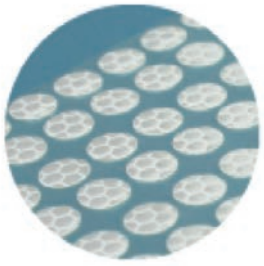
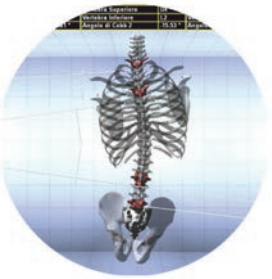


FIGURE NO. 1-2
CERVICALMETER AND SPINALMETER

N° 3 / January-April 2016





POSITIONING OF MARKERS OR SELECTION OF LANDMARKS WITH MOUSE

CAPTURING IMAGES OR FRAMES

PROCESSING AND ANALYSING THE DATA

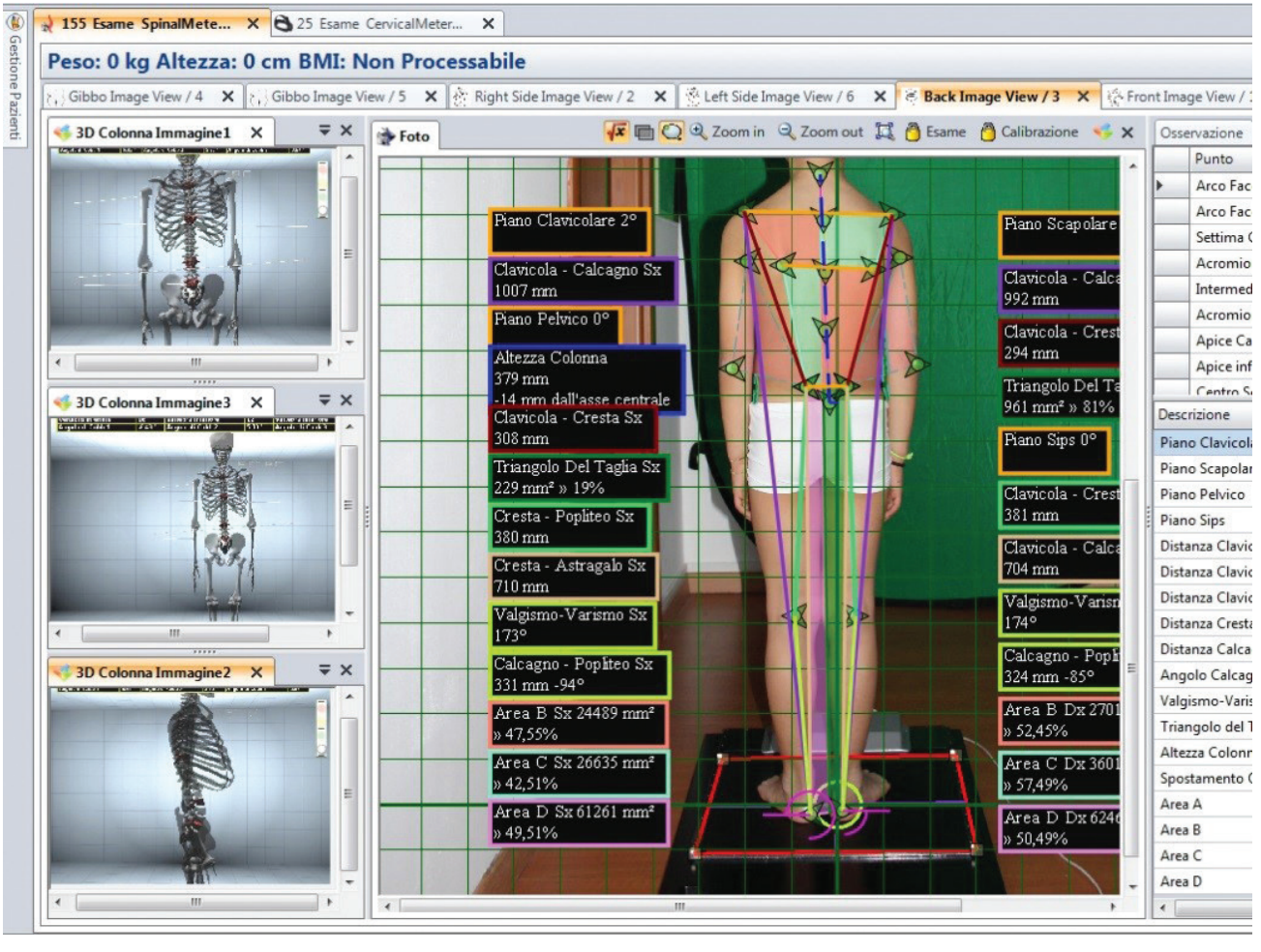
PRINT OUT OF MEDICAL DIAGNOSIS OR COPIED TO CD

This important feature allows for repeated testing, thus monitoring pathological situations and ensuring the effectiveness of therapeutic and rehabilitation protocols.

Positioning of **markers** or selection of landmarks with mouse.
Capturing images or frames.
Processing and analysing the data
Print out of medical diagnosis or copied to CD. Digital images are acquired by positioning markers on easily identifiable **body landmarks** (such as the 7th cervical vertebra, the clavicular acromion joint, the extremity of the scapula, the olecranons, posterior superior iliac spine, the heels and
other points (21 in total).
The **sophisticated software** processing the data and provides the specialists with 3 different Cobb angles and the major biometric measurements of the entire osteoarticular apparatus: scapular plane, clavicle plane, pelvic plane, dysmetria, paramorphisms, body triangles, varus and valgus deformities.

Various features:

· On the left and right sagittal **pane,** SpinalMeter traces a virtual tangent on the patient (replacing the plumb line), automatically outlines the contours of the patient's back,



and calculates the contours of the cervical and lumbar arrows.

· In the forward bending position, we can screen the dorsal and lumbar hump by measuring the distance of the hump and the calculation of the distance of the difference in height of the spinal apophysis.

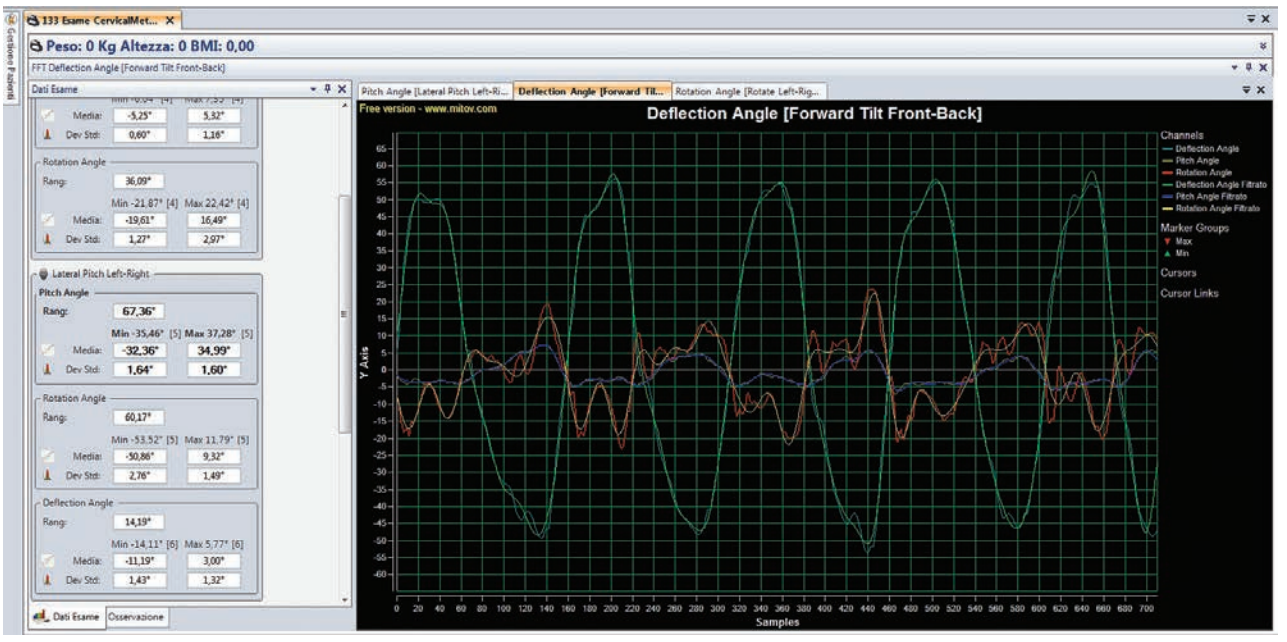
This objective exam replaces the use of the gibbometer, which often provides measurements that vary from specialist to specialist.

· On the frontal plane (this is a recent modification to the system), it is possible to acquire many other important information, such as the bi-pupillary, bilabial, biacromial planes, the anterior superior iliac spine plane, radial styloid apophysis, first and fifth metatarsal angles and triangles.

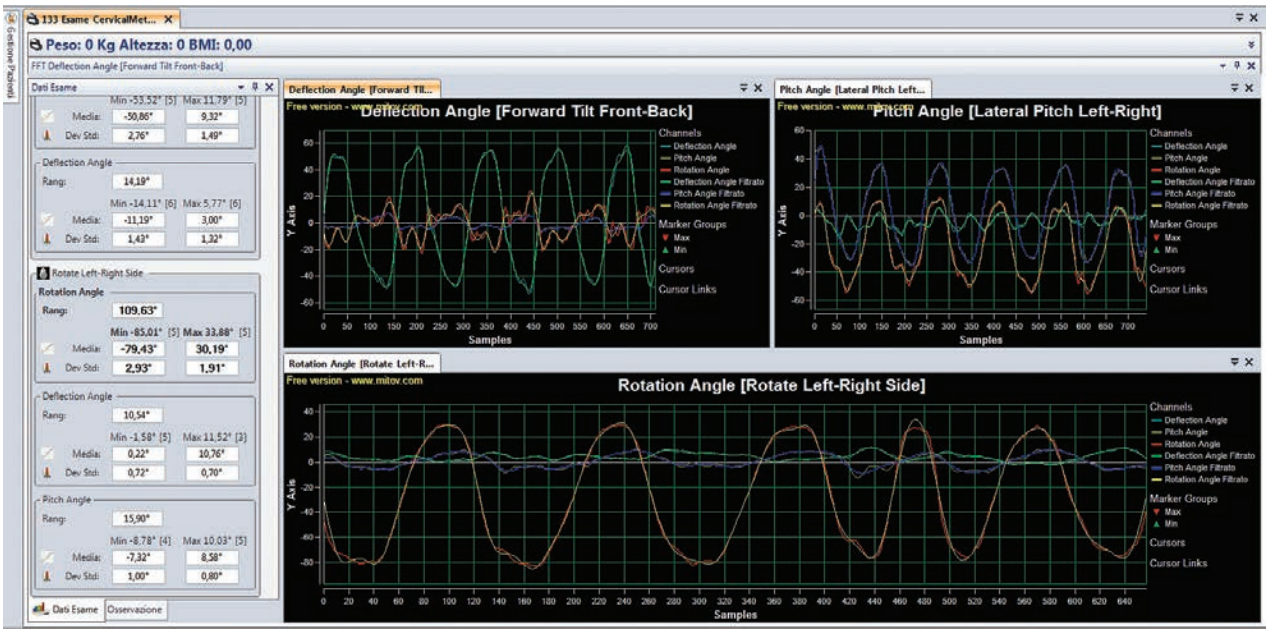
In brief, this specific exam provides:
· biometric images and measurements carried out on the four sides of the patient's back (back, front, left and right);
· 3D reprocessing of the measurement up to 3 different Cobb angles;
· dorsal and lumbar hump.

CERVICALMETER

The second apparatus, also a Class I/M certified medical instrument, is called the "**CervicalMeter**" and is designed for the specific screening of the cervical spine. It accurately measures the left and right rotation angles, the left and right tilt degrees and the flexion and extension degrees. For each of these movements, the software produces a graph which highlights the main curve and the secondary curves of movements that are not perceptible neither to the naked eye, nor with the use of other devices. For example, when we screen the left and right rotation angles, the graph not only indicates the main curve, it also shows the secondary curves of the micro-movements in tilting, flexion-extension and rotation.



DEFLEXION ANGLE

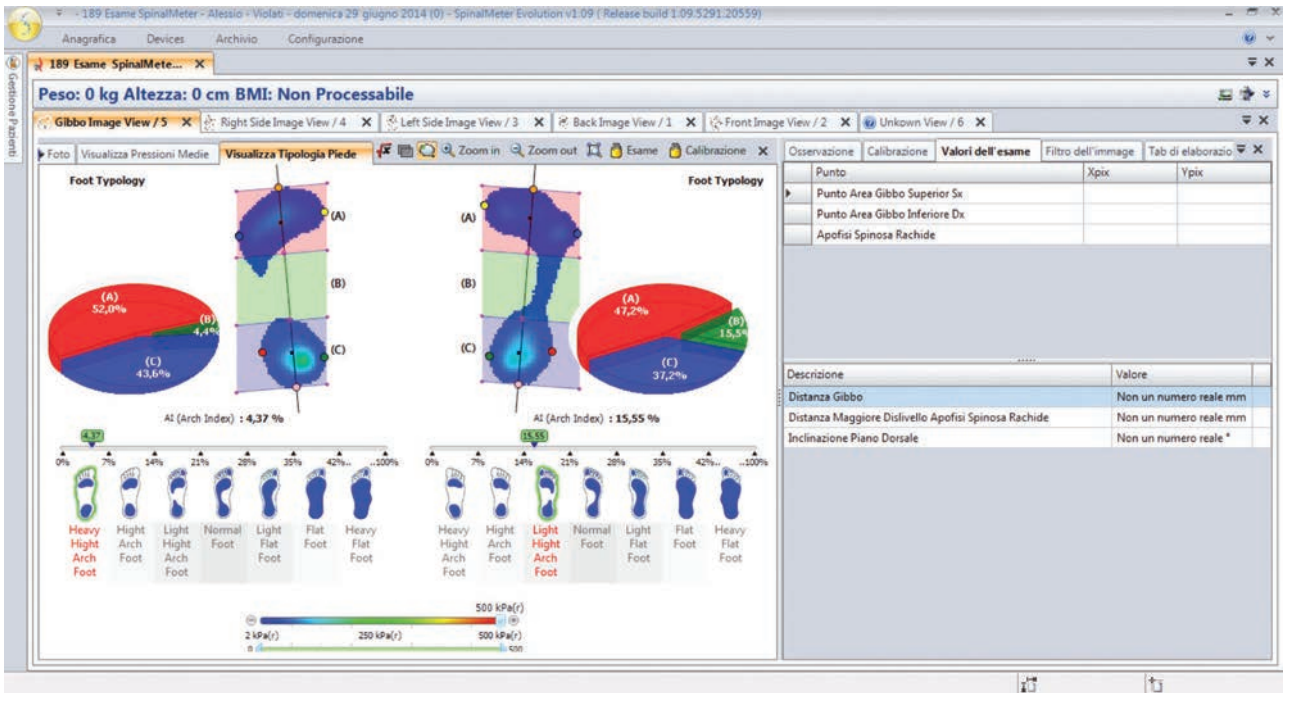


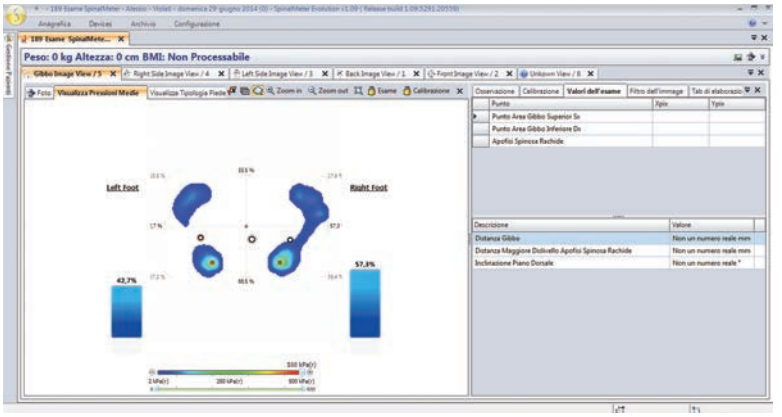
Tilt and Rotation Angle

The countless information that we obtain from these exams, provides the specialist with a substantial number of small elements that gradually make up the complex and well-structured mosaic that will lead to the diagnostic profile of the postural problems of the patient, athlete, etc.
A fundamental aspect of the system is the possibility, during the exam, to have initial (and therefore essentially objective) numerical data available, in order to make comparisons with future data.
The system is particularly useful for the analysis of problems relative to the recovery of the bilateral symmetry of the mouth and assisting in the objective screening of corrections of the unilateral asymmetric function that characterises many athletes.

BAROPODOMETRIC PLATFORM

An additional device, considered essential for the correct diagnostic research of plantar support, is the Baropodometric platform. These data are obviously other extremely important elements for our imaginary diagnostic mosaic.





"RADIATION FREE" projects

The multiple applications of these instruments are also indicated for the world of sport and also for school. Postural screening could be useful for an entire team and from there, each individual could have a personalised programme. It is essentially a sound investment for the community and for athletes, whose performances will greatly benefit and who will run less risk of injury. Postural screening carried out directly in schools would be help prevent the development of spinal disorders in growing children, when it is still possible to intervene in an effective and non-invasive way.

EVOLUTIONS

The system is equipped with a new 3D feature that reconstructs the position "in space" of the patient's pelvis. It is a vital function in order to obtain confirmation of the diagnosis. By the end of 2015, a new electronic product will be available, capable of detecting posture during athletic movements (analysis of the movement) and the pressure applied on equipment (a golf club for example) or while running.

CONCLUSIONS

The numerous biometric postural measurements obtained with these three instruments, converge in a single software which allows the posture specialist to carry out a comprehensive and objective screening. In other words, the three devices make up the pillars of an innovative clinic for postural diagnostics. Now, it is up to medical and scientific research to provide further information. Intense research is expected in the near future as regards the clinical screening of correlations between:

Biometric measurement of the osteoarticular apparatus;
Screening of the cervical spine;
Analysis of foot placement.

The aim, as one can imagine, is not only to optimise and enhance the sports performance of professional athletes, it is also - and not of less importance - in order to ensure their maximum personal health care and respect.

STEFANO SABATINI

DR. SABATINI IS A PHYSICIAN AND SPECIALIST IN SPORTS MEDICINE. HE HAS COLLABORATED WITH VARIOUS NATIONAL SPORTS FEDERATIONS AND CLUBS (FOOTBALL AND BASKETBALL) AND IS AN ACTIVE THERAPIST IN PHYSIOKINETIC AND FUNCTIONAL REHABILITATION CENTRES.

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A DIFFERENT APPROACH? THINKING OUT OF THE BOX

As a dear colleague of mine said once: "If you want different results you must use a different system". I agree but I would not only like to have different results, but if possible better results. By better results I especially mean better results the natural way.

Is there such a system? If so, what would such a system look like?

BY REMCO EENINK

Courtesy of EWF

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 intrarotation 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) .

PLEASE NOTE:
For the +105 kg category I used the average in this category from the Olympics in London 2012. Of course all the averages could be argued and by changing them a little we would receive slightly different results, but the basis formula of predicting the possible total in a higher bodyweight category would still be valid.

Men BW cat.	Height in m.	WC-10 Nr.1	WC-11 Nr.1	Os-12 Nr.1	WC-13 Nr.1	WC-14 Nr.1	Av.total	Av.diff in kg	Av.diff p kg BW	Talent formula
56	1.52	292	292	292	289	296	292			7.9
62	1.58	320	321	327	321	325	323	31	5.1	8.2
69	1.63	335	341	344	358	359	347	25	3.5	8.2
77	1.67	373	375	379	380	367	375	27	3.4	8.1
85	1.71	383	382	385	387	391	386	11	1.4	7.8
94	1.75	403	407	418	402	408	408	22	2.4	7.6
105	1.80	415	430	412	425	432	423	15	1.4	7.2
139	1.86	435	464	455	464	462	460	37	1.1	6.2

AD STATISTICS:

We see what the average difference in kg is what can be achieved by participating in a higher bodyweight category, but in our statistics the lifter is on average also taller. What if we can build up enough muscle the natural way and choose a higher bodyweight category but the lifter is still the same height? The result in total lifted should be higher. To make a more accurate prediction of what could be achieved in higher weight categories we use the talent formula.

THE TALENT FORMULA:

Talent score = (total x height): bodyweight, or TS = (T x H) : BW

As we see in the examples above the talent score for all categories is between 7.6 and 8.2 except for the -105 it is 7.2 and the +105 it is only 6.2.

What if we could use this to make a more informed prediction of what a lifter would be able to accomplish in a higher bodyweight category at the same height, or what if we could use this to make a better prediction of the bodyweight category in which he would have the best chances? For us in The Netherlands it would be the 8th place in a World Championship to get financial support. So this is a very important goal for us.

Example 1

So let us take an example of a lifter who lifted a total of 342 kg in international competition in the -85 kg category. His height was 1,70 m. His talent score was 6,84.

Prediction – 94 kg category
To predict what he would be able to lift in the -94 we proceed as follows:
Total = (6,84 x 94) : 1,70 = 378 For an 8th place at WC he would need an average of 387 kg.

Prediction -105 kg category
Total = (6,84 x 105) : 1,70 = 422. For an 8th place at WC he would need an average of 389 kg.

Our lifter would have the best chances in the -105 kg category if he is able to gradually build up the necessary muscle. The range in the -105 kg category was 2010 - 2014 between 382 – 395.

I believe it is not possible to compete successfully with other lifters the natural way if your height is the same as your competitors in the same bodyweight category. So we must look for a fair advantage and in my opinion this can only be found in more muscle at the same height than your competitors.
Below I will show you how our system works and how the training is planned.

PLEASE NOTE:
We use a system in which strength and technique is trained separately, but this does not mean it is the only way.

Our macro cycle of 18 weeks is divided in to the following phases:

- Special training phase;
- Muscle building – conditioning phase;
- Coordination I phase;
- Coordination II phase;
- Pre-competition phase.

Special training phase

- Training: 5 – 6 days per week;
- Total time: 21 days (3 weeks);
- Exercises for instance: front – and back squats;
- Frequency: 1 – 2 x per day;
- Sets: 8 – 10 reps per set;
- Intensity: low.

Actually the special training phase is meant to strengthen weak areas, which in most cases is leg strength. Of course this period can also be used by the lifter to strengthen other weak areas.

Muscle building and conditioning phase

- Training: every day;
- Total time: 6 weeks;
- Frequency: 2 x per day;
- Sets: 8 – 15 reps per set;
- Intensity: low

After 5 – 6 weeks the arms and legs have increased 2,5 – 3,5 cm and bodyweight is up 6 – 7 kilos.

Important:
To avoid weak areas we should develop all muscles involved in Olympic Weightlifting. Because we train the muscles very locally the body can recuperate very fast and can actually super compensate the next training day.

Exercises for building muscle and conditioning are:BW cat. Height in m.	
1	Seated dumbbell tricep extension (one arm);
2	Lying supine on bench dumbbell front deltoid raise (two arms);
3	Lying supine on bench dumbbell tricep extension (one arm);
4	Seated dumbbell front deltoid raise to vertical position (one arm);
5	Bent over dumbbell tricep extension (one arm);
6	Lying on bench face down dumbbell deltoid side raise (two arms);
7	Seated dumbbell curl (one arm) optional;
8	Dumbbell shoulder shrug (two arms);
9	Bent over dumbbell rowing (one arm);
10	Stiff legged barbell deadlift;
11	Weighted sit – ups: upper abdominals;
12	Weighted hyper extensions with barbell;
13	Weighted sit – ups lower abdominals;
14	Legs adductor on machine;
15	Legs abductor on machine;
16	Gluteus on machine;
17	Leg raises on machine (one leg);
18	Leg extensions on leg extension machine;
19	Leg curls on leg curl machine;
20	Standing toe raise on calf machine;

Coordination I phase

- Training: every second day;
- Total time: 24 days;
- Frequency: 2 x per day;
- Sets: 8 – 4 reps per set;
- Intensity: weights are gradually increased.

Ad Coordination I phase:

The muscle must learn to work together again so we start light and increase weights each training session. First session all reps are performed slowly and gradually more reps are performed fast until the last couple of sessions all reps are performed fast. Strength will increase very, very fast.

Although it is also possible not to split up the training and do 4 exercises in one training session we prefer to do only 2 exercises in 1 session because recuperation is much faster that way.

Coordination II phase

- Training: every second day;
- Total time: 24 days;
- Frequency: 2 x per day;
- Sets: 5 – 3 reps;
- Intensity: weights are gradually increased.

Ad Coordination II phase:

First few sessions all reps are performed relatively slowly later more and more reps are performed fast. Here it is also possible to do 1 session of 3 - 4 exercises, but we prefer 2 sessions per training day because recuperation is much faster this way.

K 1A AND K 1B ARE ALTERNATED FOR A TOTAL OF 12 TRAINING DAYS. TRAINING EVERY SECOND DAY. EACH TRAINING DAY IS FOLLOWED BY 1 DAY FOR RECUPERATION FOR A TOTAL OF 24	
K 1A – MORNING 1 OVERHEAD SQUATS: 2 MUSCLE SNATCHES:	 SETS OF 8 – 4 REPS SETS OF 8 – 4 REPS
K IA – AFTERNOON 3 HIGH PULLS - CLEAN GRIP: 4 JERKS FROM BOXES:	 SETS OF 8 – 4 REPS SETS OF 8 – 4 REPS
K 1B - MORNING 1 FRONT SQUATS: 2 MUSCLE CLEANS:	 SETS OF 8 – 4 REPS SETS OF 8 – 4 REPS
K IB - AFTERNOON 3 HIGH PULLS - SNATCH GRIP: 4 MILITARY PRESS:	 SETS OF 8 – 4 REPS SETS OF 8 – 4 REPS

K II A AND K II B ARE ALTERNATED FOR A TOTAL OF 12 TRAINING DAYS. TRAINING EVERY SECOND DAY. EACH TRAINING DAY IS FOLLOWED BY 1 DAY FOR RECUPERATION FOR A TOTAL OF 24 DAYS.	
K II A MORNING 1 FRONT SQUATS: 2 POWER CLEANS:	 SETS OF 5 – 3 REPS SETS OF 5 – 3 REPS
K II A AFTERNOON 3 SNATCH FROM KNEE: 4 PUSH PRESSES:	 SETS OF 5 – 3 REPS SETS OF 5 – 3 REPS
K II B MORNING 1 POWER SNATCHES:	 SETS OF 5 – 3 REPS
K II B AFTERNOON 2 CLEAN FROM KNEE: 3 JERK FROM BOXES:	 SETS OF 5 – 3 REPS SETS OF 5 – 3 REPS

Pre competition phase

- Training: every 3rd day;
- Total time: 15 days;
- Frequency: 1 - 2 sessions a day;
- Sets: 1 rep;
- Intensity: Here maximum intensity is reached.

Ad pre competition phase:

Here too we can choose to do the training in 1 session instead of 2. Two sessions per training day makes faster recuperation possible.

Three days after the last training day the competition is planned.

After the main competition at the end of the macro cycle the lifter takes a brief vacation and starts training again using light to medium weights and concentrates on technique. Here is also room for some athletics, running, jumping, swimming, bicycling. After this we will start all over again. When the lifter eventually reaches his goal and does not want to compete in a higher bodyweight category he can still use the same system but he has to restrict his calorie intake. He can still use this training system to improve his total.

Does this system work?

My former German trainer was famous in Germany for his outstanding results that were achieved by using this system by many athletes. They came to him from all over Germany. His best example was perhaps Rudolf Mang who won the silver medal in the Munich Olympics in 1972. I also made astonishing and fast results but I was forced to cut down on my training considerably early 1972 because of combining a full time job with my study German language and literature at the university.

This article is a tribute to my former German trainer Josef Schnell, who passed away 26th of September 2010. He has had a great influence on my life as a lifter and as a coach. I thank him for sharing his vast knowledge with me.

PRE COMPETITION PHASE TOGETHER 5 TRAINING DAYS. TRAINING EVERY 3RD DAY. EACH TRAINING DAY IS FOLLOWED BY 2 DAYS OF RECUPERATION FOR A TOTAL OF 5 X 3 = 15 DAYS.	
PCP MORNING 1 SNATCH	15 – 20 SETS OF 1 REP
CP AFTERNOON 2 CLEAN & JERK:	15 – 20 SETS OF 1 REP

REMCO EENINK
MEMBER TECHNICAL AND SCIENTIFIC COMMITTEE FOR COACHING & SCIENCE EWF
EXECUTIVE MEMBER EUROPEAN UNION WEIGHTLIFTING CONFEDERATION - EUWC

The official journal of the European Weightlifting Federation

BEYOND TRAINING.

This article continues from the previous issue: N°.2 August/December 2015 (pag. 17)

BY ALBERTO ANDORLINI

The official journal of the European Weightlifting Federation

BODY. MOVEMENT. AND BODY IN MOVEMENT. IN OTHER WORDS: INSTRUMENT. MEANS. AND PURPOSE.

INTRODUCTION.

We have seen side by side, how the analysis of two terms - Form and Function - related to different fields of study - Exercise and Equipment, Body and Movement - can generate interesting "mutual correspondence". It can, most importantly, can lead to the (functional) exploration of misunderstood, unrecognised or unexplored territories (techniques, methods, disciplines) and foster the breaking down (formal) of unnecessary barriers between opposing and contrasting operational scenarios (training, pre-habilitation, rehabilitation). In previous articles, I suggested a reinterpretation of known terms, along the line of a purely theoretical discussion. The terms in question are not outdated, worn survivors of a defunct grammar; in their simplicity - so obvious that it seems trivial - they imply meanings and values that go beyond their conventional appearance. By broadening meaning and enhancing understanding, they can contribute to the development of a language, which if not new, is at least differently oriented or otherwise attentive.

Training in itself does not have its own adjectives. When the term "training" is associated with more or less generic attributes ("physical", "technical", "tactical"); indications relative to the capacity target ("strength training", "resistance training", "speed training"); regional specifications ("leg workouts", "abs workouts", "arms workout"), the meaning that the term itself implies, does not change. But above all, the methodological principles do not change, as do neither assessment regulations nor ways of distributing the load.

In the following article, we discuss motor ideograms and pictograms; the phylogeny and ontogeny of Movement; Transitive and Intransitive Movement; the four stages of the motor restructuring process; an instrumental "hierarchy" consisting of three consecutive levels.

SHADOW PLAY. ALWAYS LISTENING.

The term "gymnastics" derives from the Greek verb "γυμναζω", which means "to practice in the nude." Athletes in Greek gymnasiums practiced naked with their bodies covered with oil. Now, one might say that the actual movements - "daily" movements, those that engage us either statically or dynamically, 24 hours a day - differ from a gymnastic movement (from the solemn action of the Discus Thrower, the Spear Bearer, the Apoxyomenos), for the sole reason of not being performed naked. Moving in a regular way qualifies movements as "ordinary"; moving not naked, but with shorts, shirt and sneakers, qualifies movements as "extraordinary". But, if we take a closer look, the "hieroglyphic" representing movement is the same; the shadow cast by a body in motion is not ordinary or extraordinary, it is not "naked" or dressed, it is not motionless or moving; it is simply and consistently, voluntarily or unconsciously, searching for a Position, a Movement or an Action; it is – or rather it should be – constantly "listening", always ready and responsive.

"Beyond training" lies within this assumption, 1. "conditioned" because it is connected to the vision of an increasingly "extraordinary" performance and 2. "conditional" - as it should be - because it is connected to the choice of priorities and to the methods that we define as training; it gives the title to our discussion and it extends the time of a training session, going from one hour, to two, three, 24 hours a day. The goal is not to change a body's habit, or to establish lines of separation that subdivide and decompose Movement, but rather to invest it with a formal and functional implication to extend and guide its meaning.

In the previous article, we fitted Body and Movement with Form and Function. Combining in a purely theoretical way, the volumes that make up the body, with a complex relational function, we hypothesised to make the body Forms function in a finalistically oriented direction, through Movement. We considered the body as an instrument of a process, in which Movement becomes a means; and the Body in Movement, the purpose.

Movement can move the Body (intransitive movement) or, in moving the body, it can establish a relationship with people and things (transitive movement). The formal

expressions of "moving" and "to move" are eight essential ingredients (the eight basic movements: *rolling, squatting, stretching, taking a step, pushing, pulling, turning, bending, moving*). The eight basic movements - when changing from one Position to the next, and in the combination of several movements in Actions (we will take a closer look at their taxonomic relationship in our next article) - constitute the practice (the actual doing) through which the fourfold function of Movement takes place *(ensuring Balance, allowing the Relationship, leading to the Finalisation, encouraging the Expansion of the comfort zone)*.

If we were to "strip" our daily movements (I get up, I bend over, I lie down, I grasp an object, I carry a weight, I move obstacles, I climb a step, I close a door, etc.) of what identifies them as usual and ordinary, replacing them with neutral silhouettes, we would have a code made up of motor "ideograms", able to express the more technical meaning of the movement (associating a squat with a lunge & reach, bending with a twisting motion, pushing & pulling, etc). By changing how we read a code, we change the idea and meaning of the movement. In other words, once stripped of the idea, of the image that qualifies them as "ordinary"; once fitted with Form and Function; and associated with the Form and Function of the Body; all daily movements become "extraordinary", aimed at the achievement of a goal, that is, the optimisation of Performance.

That "performance" (ordinary and extraordinary) that cannot be limited to a single instant, to a single session, to a single moment, to a single execution, but which must be extended (forgive the pun) to all movements and ... to all the elements, common to every movement. The ideogram (the sign that expresses an idea) will become a pictogram (the code that expresses a meaning) when we attribute to the Form of Movement a function, aimed at training, rehabilitating, pre-habilitating, or, more simply, at enabling the Function of the Body by the sequential and consequential alignment of the Forms that compose it.

THE DICE. IN THE TRAINING GAME.

In the concept of a training session that enables Forms and Functions, the ability to do (praxia), knowing how to do it (gnosia) and knowing how to do it well (skill) are the three "unique" sides of an ordinary dice; a dice that, if cast, may generate unpredictable and unexpected combinations. Especially when the remaining three faces are, by contrast, entirely "usual" terms, such as Positions, Movements and Actions.

Remembering the basic movements and defining the performance

matrix, allowing an economical and efficient transmission of force through the segments and links of the kinetic chain with the minimum objective of avoiding de-habilitation, is the principle that identifies the proposal and qualifies the elements - that constitute the skeleton, both methodological (principles), and practical (exercises) - like transversal agents of the three systems: **1. Training 2. Pre-habilitation and 3. Rehabilitation.**

Precisely because of their transversal nature, the principles (theory) and exercises (practice) *will be applicable in a non-exclusive but synergistic manner* to the contents of training, pre-habilitation and rehabilitation.

HABILITATING, NOT TRAINING.

Dictionaries tell us that to get the best from a system, you must habilitate the system itself.

'"HABILITATE", is certainly not a coined word, it has been adapted and adopted into our common use, a "new" and "useful" word for our working scenario, as it implies the need to "habilitate" Body and Movement to cope with disturbances, interferences and the correction of dyskinesias and "arrhythmia", improving the alignment of form and function, the stability and the adaptability of the subsystems.

Operational innovation leads to new criteria for the selection of "habilitating" stimuli, favouring means and content that present features, characteristics and properties which are at the same time preventive, conducive to training and rehabilitative.

In expanding the concept, in order for training to be habilitating, it must comply with training standards, when addressing the reduction of inhibiting and conditioning "brakes" and limiting performance; it is a question of "Pre-habilitation" *(habilitate before*), or "Re-habilitation" (*habilitate again*), depending on whether the targets are the prevention of the risk of injury (Pre-Hab), or the return to normal function, and the reduction of risk of re-injury (Re-Hab).

The first **conceptual acquisition**, therefore, is that the main Performance identifies with everything that follows from and results in the vital relationship with the outside world *(handling unforeseen and/or unpredictable situations, optimising our responses to often conflicting stimuli, neutralising gravitational interference and disturbances)* and that an efficient Body that Moves effectively represents the final station of the training process.

Following this assumption, training means habilitating systems to life, or rather, to "relational survival" that contrasts the distorting and dysfunctional effects of an activity which by now is "dynamically static".

When our ancestors climbed up a tree or a lifted an object, they did not do so with the intent to build muscle mass or reduce body fat, but in order to perform a function that was part of their daily routine.

Our ancestors repeated on a daily basis, a series of motor movements that helped them survive and which we have erased from our memory. Their function - survival - was built on the ability to assemble, in relation to the requirements dictated by the environmental situation, 8 simple movements. The 8 basic movements ("Rolling, squatting, lunging, bending, twisting, pushing, pulling, gait") represent that motor legacy which today has been impoverished by habit or disuse. It is interesting to see how those movements, simple and basic enough to be neglected, represent the result of the motor evolution of our species.

Every movement has developed along a phylogenetic line, adapting to the "momentary" demands and needs dictated by evolution. Each movement, as we know it, is the result of a process of "crystallisation" which lasted millions of years. As for the Body, "Form has followed Function", so we can loosely say that, for Movement, "ontogeny recapitulates phylogeny" (Haeckel's theory). Ontogeny is the set of processes by which the biological evolution of the individual human being is accomplished from "conception" to "birth".

Phylogeny is the evolution of the species to which each individual belongs.

The first consequence is that the individual embodies the "established history" of the entire species to which they belong. This story naturally is made up of the winning variants that have shaped the species over time.

In the case of **MOVEMENT**, we will stretch things a little conceptually to talk about an ontogenetic line going from birth to the completion of the first year of life (see Infant development stages); a period during which the infant learns, experiences and consolidates those movements, which are always the

same, and inherited phylogenetically **(Fig.3)**. The recovery (re-habilitation), improvement (pre-habilitation), training (pro-habilitation) of skills traces the structuring neonatal motor stages. From horizontality to verticality by gradual removal of supports. From a position without rotation, to movement with rotation. From movement in a single position to movement in motion.

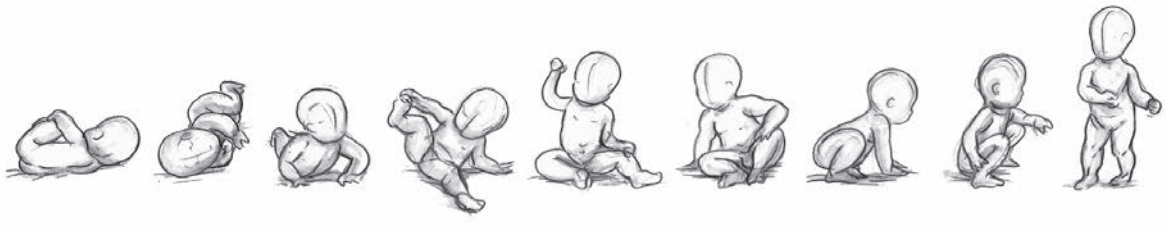

FIGURE NO. 3
MOTOR LEARNING

In both scientific and popular literature, which refers to and establishes the Theory of Functional Training, the terms overlap in several associations, with particular reference, which do not always coincide. Here I shall attempt a translation that simplifies the concepts expressed by far more authoritative sources, tracing a sequential line that runs from the "human" movements of our ancestors, to the "superhuman" movements of elite athletes. The "primal movements" [PRIMAL PATTERNS (Paul Check)]) are the "phylogenetic" precursors of the "first movements" [PRIMITIVE PATTERNS (G. Cook, L. Burton)] that the child explores, experiences and refines until he develops and establishes them as the "8 basic movements" of adulthood [FUNDAMENTAL MOVEMENT PATTERNS (P. Check)]; the "eight basic movements" produce "ordinary" actions (REAL LIFE MOVEMENT), which in turn can be turned into "extraordinary" motor sequences [SPORTS SKILLS (V. Gambetta, C. Santana)]1 **(see Figure 4)**. It is curious to question the quality of the outcome of such a progression. The process of motor learning exhausts the powerful phylogenetic drive, concentrating the determining features in the first year of life and honing gestural characteristics over a period of time that varies, depending on the environmental stimuli, the preeminent anthropological model and the dominant socio-cultural stimuli. From a certain point onwards, too complex to identify and impossible to define in absolute chronological order, the natural habilitating input are lost, making way for dehabilitating interferences and habits.

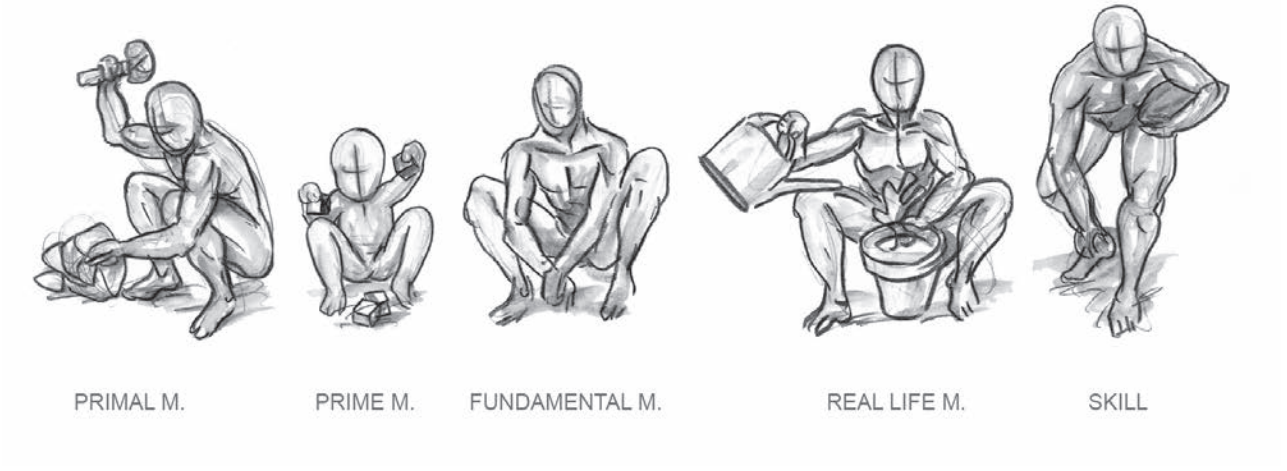

FIGURE NO.4
FROM PRIMITIVE MOVEMENTS TO SPORT SKILLS

A THIRD STEP. NOTHING NEW. NO INVENTION, NO DISCOVERY.

Body and movement are the only unalterable references. Nothing new. No invention, no discovery. Only distinctive elements. Or different attention to the principles that shape the system.

1. The restructuring path of Movement is distinguished by four basic stages: dysfunctionality, the isolation of a component of the kinetic chain resulting in the fragmentation of the chain; non-functionality, the selective sensitisation of a component in the chain; pre-functionality, the interaction of multiple components of the kinetic chain; functionality, the integration of multiple kinetic chains in a real action.

2. There is a typical instrumental hierarchy. The return to the body being used as a tool, as an imperative inherited from the Gymnastics of ancient times ("first instrumental level "); the rediscovery the environment (floor and ground), as elements of gravitational support ("second instrumental level"); the rediscovery of the form and material of objects ("third instrumental level") with which to move, all make up the distinctive features that make Movement Training "recognisable."

3. Everything that is oriented to the functionality of Movement is integrated, flexible, unlimited, physiological, real, a product of a chain reaction, subject to gravity, life-like, biomechanical, proprioceptive, multidimensional. All that - for years - was geared towards the functioning of the body is isolated, rigid, limited, artificial, unreal, produced by link action, subtracted from gravity, lab-like, mechanical, misleading, one-dimensional (Gray G).

4. If, as always, Body and Movement are the only unalterable elements, there can not be anything "new", but only different, temporary views and interpretations that obey a logical and rational continuity. They are - as always - the terms of reference that change and continue to change. The understanding of the vital functions changes, the aim, be it collective or individual, changes, the order, the number and size of the components of the performance change, the social fabric changes, the place changes, the language changes.

THE ABC OF MOVEMENT.

INTRODUCTION.

The ideas suggested by the "functional" debate encourage a deeper analysis of the topics related to Movement. Movement, which we learn every day and then forget to exercise, that we practice out of necessity and we abandon out of convenience, that we train and at the same time wear out; Movement that originates from an essential alphabet. There are 7/8 movements that make up the essential paradigm of Movement. The seven-eight "primordial" letters mixed in finalistically organised motor sequences, make up Words with a complete sense of meaning: primitive skills. Skills are the weapon, the only weapon, that we use against the interferences dictated by our being bipedal, obliged to assume a constantly verticality postural imbalance, and oriented to a life of relationships, which is relational survival.

At the risk of being pedantic, let's return to a theme already mentioned in previous articles. The actual Fundamental Movements are: Pushing, Pulling, Squatting, Bending, Lunging, Twisting, Rolling and Gait. Each of them constitutes, from a purely metaphorical point of view, a letter. The seven/eight letters represent the essential motor kit. A kit that, though numerically narrowed down, allows an almost infinite variety of associations. The primary associations, let's say the first words, in their formal elementary typing, make up an additional kit, that of the main Actions: Maintaining a posture, Maintaining balance, Standing up, Sitting, Lying Down, Rolling, Walking, Running, Escaping, Accelerating, Stopping, Changing direction, Getting up up, Getting down, Climbing, Jumping, Bouncing, Landing, Taking, Placing, Carrying, Picking Up, Hitting, Parrying, Dodging, Throwing, Catching, Handling. Each verb, each skill, corresponds to the synchronous and simultaneous association of multiple Fundamental Movements. The resulting motor wave (Kinetic Chain) has, in the pre-activation of the central element of stabilisation (Core), in opposition to the drive of gravity, in the dynamic posture adjustment, the referential kinematic prerequisites.

Each skill, corresponding to a verb, in order to express a sense and be placed properly inside a motor "periodisation", must be adapted to the person (difficulty), time (inten-

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sity/volume), way (pre-habilitation, rehabilitation, pro-qualification or actual training) and diathesis (transitive or reflexive movement: I move or I move something).

Movement therefore can be assigned a broader spectrum - work, sports, real life - as well as the words make up the simple expression of a sentence, or the complex plot of a story or a poem.

Training using "letters" means composing "words", that are more and more complex, composing and decomposing sentences, reaching understandable and realistic sequences that prepare the chosen linguistic form (sports movement, art movement), or relational expression (work , health, play).

POSITIONS, MOVEMENTS, ACTIONS.

Learning how to Stand, Move and Act. We have "seen" how Functional Training, when read in its originating and original form, can translate into a more comprehensive range of training, the ideal bridge between fields of motor intervention up until now considered separate. The triangulation between the terms Position, Movement and Actions constitute the operational skeleton of a training approach which is neither new nor innovative, but rather oriented towards 1. the improvement of the bipedal condition (existing, living and surviving as humans), 2. the optimisation of the relationship between bodily FORMS (competition and consequences of the activation between volumes and segments) and relational FUNCTIONS (body efficiency and gestural effectiveness), 3. the increase in capacity and quality (performance). All this implies an adherence, always careful and critical, to unconventional methodological concepts and structures of thought: the body is a set of forms that can be isolated, but kinetically cohesive, with divisible, yet finalistically integrated functions.

Educating on position (preparing an action), movement (building an action), action (connecting and directing positions and movements), ability (qualifying the action) - using the *body* as an instrument,

exercise as a means, *movement* as the end and the body in movement as a result - is to open a "strategic" , as well as methodological window, on a *training* framework that crosses three operational fields up until now considered very far apart: Training, commonly interpreted and understood ; the often misunderstood, Pre-Habilitation; and Re-Habilitation, as it is generally widespread and shared. Let us dwell briefly on three, frequently used terms - Position, Movement and Action, illuding ourselves that we fully know the theoretical and operational implications, and let's try to place the term "Skill" - in purely hypothetical manner, as the final summary of the theoretical framework and the common goal as several motor pathways. I would like to underline how the two terms - *Position and Movement* - imply vast areas of interpretation and lead to different models from a purely executive point of view.

POSITION

The first - Position - is bound to the memory of the term gymnastics. The traditional nomenclature identifies the location in the figures that the person's body, or part of it, assumes, in relation to the outside world, and/or in the figures that the various parts of the body assume considered in relation to each other (Initial position - departure - arrival - final - intermediate - symmetric - asymmetric). The Position is clarified by further adjectives: *Posture and Pose*. Posture is the figure that assumes the person's body or part of it, regardless of the environment that surrounds it (action: long, short, wrong, simple combined). Pose is determined by the position of the centre of gravity of the gymnast in relation to the means of support (action: simple - derived - combined; supported - erect - sitting - kneeling; supine - prone - lateral; suspended; in flight). In functional lexicon, however, Position includes and encompasses different terms relatable to each other and interacting with each other: Dynamic Posture, Inner & Outer Zone, Balance, Stance, Holding Postures, Poses.
As no doubt, in an attempt to refer to a more adaptable and inclusive terminology, the term Position identifies "the statically active unit, on which Movement is based", and is qualified by obvious spatial obligations (horizontal/vertical; tri-, bi- or monopodalic contexts; short/long, low/high; rotated/straight; etc.).

MOVEMENT

Once more drawing on gymnastics glossary, Movement, is defined as the displacement of a person's entire body, or part of it, between two positions. If Movement involves moving the centre of gravity, and becomes synonymous with Locomotion, Translocation, Transfer, on the other hand, the *Gymnastics Actions* that normalise movement are based on spatial and anatomical references. The use of axes and planes lead to motor verbalisations typical of an almost forgotten language: raise, lower, splay, join, cross over, leap, flex, bend, stretch, stand on tiptoe, push, tilt, twist, flip, swing, rotate, abduct, adduct, pronate, supinate. *Gymnastic Movements* then, depending on whether they involve only one part of the body, one body part with other movements of a different nature, two or more different parts of the body, can be classified respectively as

- simple movement: performed by only one segment of the body with a single action;
- compound movement: performed by only one segment of the body with dual action (e.g.: elevation and flexion of the arm);
- combined movement: performed simultaneously by two or more segments of the body.

Let's return to functional vocabulary. Movement is considered the expression of a kinetic wave directing gestural finalisation from the centre (core) to the periphery (distal segments). Movement is a unique and unrepeatable event that involves multiple joints (multi-joint) on several levels (multiplanar), which aims to neutralise the gravity-dependent core, generated by the transmission of a load on a myofascial line, according to a relationship of alternation between mobility and stability, acceleration and deceleration, absorption and production of forces. There are eight isolable movements: Rolling, Pushing, Pulling, Squatting, Lunging, Bending, Twisting, Gait. In brief, a Movement is nothing other than the dynamic module, on which the finalised motion, or rather, the Action, is assembled.

ACTION

Formally, the Action results from a motor concurrency - a series of associated basic movements - and by joint segmental participation - adjacent segments on the same ki-

netic line activated synchronously and simultaneously.
In this way, the sum of Squatting, Bending, Pulling, Twisting, Gait and Pushing will result in a chain reaction. The final equivalent of the chain will then be an Action - as it usually is, yet it is by no means banal - i.e.: I lift a weight from the ground, I bring it to my chest, I turn around, I walk around with it, I lift it above my shoulders and I put it on a shelf. All done by automatically pre-activating protective circuits (anticipatory postural adjustments).

SKILL

The concept of Skill, by the comprehensive nature of the very term, includes extensive meanings. In it, we condense complex content, obtaining an extended mental representation. Skill usually includes manual, artistic, intellectual, communicative, motor direction competence and expertise. In other words, in the original concept of Skill, the availability and the competence of several resources are aligned and added up: from know-how, to knowing how to think, to relate, to be able to move, from concrete to abstract, from instinctive to rational.[2 3] The etymological origin of the term dates back to the Latin **"HABILITAS"** [4] that dictionaries translate as *"aptitude"*, *"fitness" and "ability"*. (Note: we know that the latter term in the motor sphere actually has a very different meaning from that attributed to Skill). In the physical, neuromuscular, motor or psychomotor sphere, the term Skill implies the execution of feats, actions, movements, gestures, behaviour or other, that over time and space have been described and redescribed many times until they have become automatic and harmonious.
Every act, every action, when concurrent with the improvement of life in relation to the outside world, is an Skill.
Maintaining a balance between actions (extrinsic) and reactions (intrinsic), will generate an economic projection and effective projection; and the body - the agent - can establish an aesthetic and efficient relationship between the single parts. Only then the elementary motor modules (movements), prepared on the basis of a static unit (position), and assembled in Actions aimed at the achievement of a goal, will produce a Skill.
In the field of ORDINARY SKILLS (I sit down and stay sitting correctly;

I get up from the ground correctly; I bend down to tie my shoe, correctly; I balance on one leg, correctly, while putting on a sock, etc.), there are as many EXTRAORDINARY SKILLS (those we know and appreciate as sporting/ competitive endeavours and artistic/expressive creations).

There is, however, a terminological dichotomy between the terms Skill and Ability, especially when related to the motor field. "Being able to" does not mean "being adept at"; it does not mean to master a skill. The so-called conditional physical Abilities, are not synonyms for Transferable Skills. The former can be considered "accumulators" of energy, the second "Transformers" of energy into purposive motility.

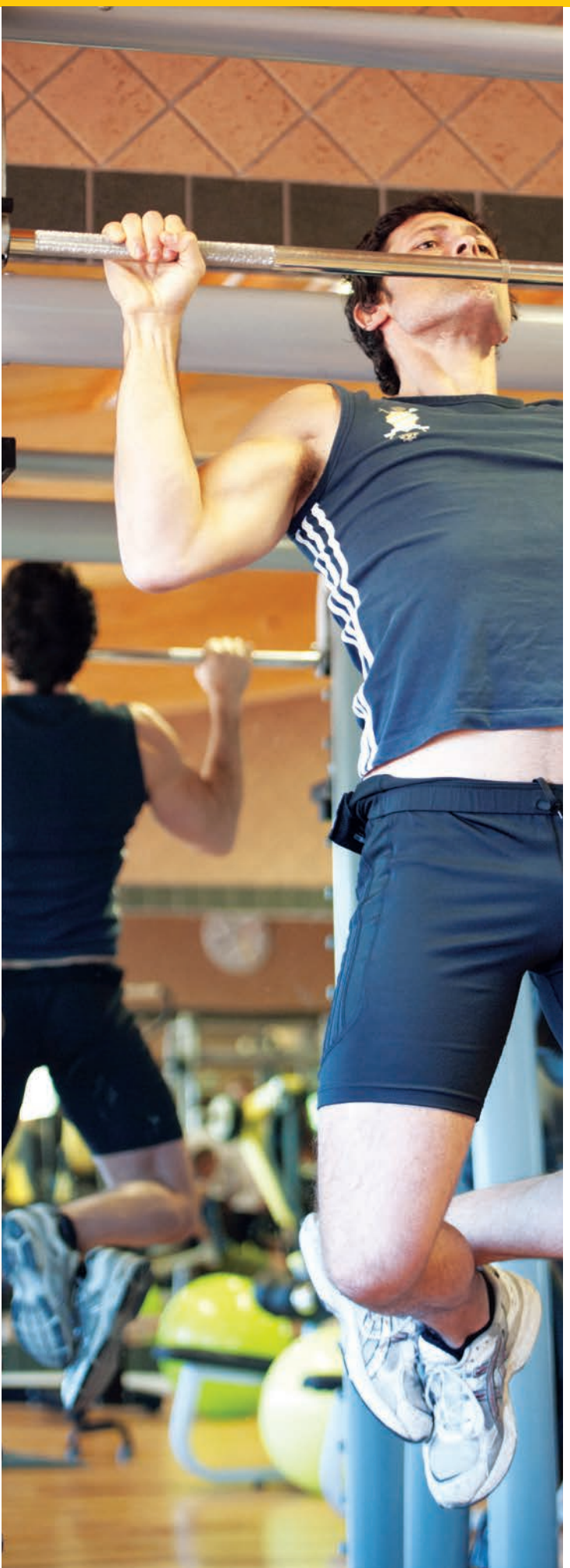
For a better understanding, we refer to Schmidt and Wrisberg[5] who justify this diversity of content using, by analogy, the terms **hardware**, to represent the "ability" and **software** for the "skills". In other words, the abilities are the indicators of the power and memory of the computer; whereas skills represent upgraded programmes, and allow the user to develop the plasticity and adaptability of the system. Even the strongest, toughest, fastest computer in the world is of no use in the absence of software programmes that can maximise and optimise its performance.
Limiting our exploration only to cognitive and motor areas, we will see that a cognitive skill is one which focuses on "knowing what to do", while in a motor skill emphasis primarily focuses on "performing correctly".
Limiting ourselves to one motor field, we will have Open Skills and Closed Skills. Open Skills are typical of the tasks performed in an unpredictable and changing environment. For example, all moves in a sports situation, where continuous adjustment to events is necessary.
Closed skills correspond to the motor requests, whose performance is not affected by the environment which, remaining passive, allows movements to be planned ahead, e.g. gymnastic exercises, or running on an athletics track.
Whatever the point of observation, discrimination, filtering and classification, being skilled involves the production of a skill (e.g. running) and implies being sure of one's abilities (e.g. How long or how fast you can run). The control, the mastery of a skill is reflected in an increase in the effectiveness of the gesture (e.g. maximising pressure on the ground while running), in improved efficiency of the system (avoiding obstacles while running), in greater resistance to mechanical stressors (e.g. dissipating "aggressive" forces while running), in the decrease in energy expenditure (running cost-effectively), and sometimes in the reduction of the movement time (optimising internal actions and reactions while running).

THE TREE THAT MOVES.

We have made a distinction between Key Positions, Fundamental Movements, Combined Actions and Primary Skills. A key position is always distinguished by at least one dominant spatial feature (e.g. support or suspension; horizontality or verticality, short or long, high or low). It is the smallest unit in the static form of movement and can be compared to the ROOTS of a tree. Fundamental Movements arise from Key Positions and develop along lines or trajectories consistent with the requested spatial allocation. Fundamental Movements can be compared to the main BRANCHES. A series of mutually connected Fundamental Movements generates complex patterns which we call Combined Actions. Combined Actions can be compared to secondary branches. Skills ("knowing how to squat", "knowing how to bend", "knowing how to lift", "knowing how to carry," knowing how to run", knowing how to balance") are Actions performed in order to determine the improvement of vital and relational rapports with the outside world (objects, people, situations). Skills are generated by a sequence of Movements, connected, albeit by infinitesimal fractions of time, by Positions. Skills can be compared to the FRUITS of a tree[6]. The Tree Rehabilitates, Pre-Habilitates and Trains. Or more simply: it habilitates. Each body to Habilitate may have the same roots, the same branches, but, more often than not, different foliage produces different fruits.

THE PYRAMID AND THE STAIRS OF A THOUSAND STEPS.

The Tree unites, it does not fragment. Three "basic" elements (Positions, Movements, Actions), qualify training as a firmly planted "pyramid" structure. The three motor elements are found at the corners of the base with Skills are at the apex. Opening the door of the pyramid and climbing to the top requires constant work. The many



staircases represent the positions, the many alternative paths, the actions, the many steps, the actions. Many possibilities. Many variations. Many variables. Many results. But only one apex. And just one consideration: Rehabilitation, Pre-Habilitation and Training rest on the same formal base and they have as the single functional purpose, the same apex of the pyramid.

A FOURTH STEP AHEAD. TRAINING IS REHAB AND REHAB IS TRAINING.

Throwing the "dice" and clearly interpreting the result; climbing a "tree that moves", following a plan that is not rigid and unchanging, but can be individually adaptable; opening the door of the pyramid and climbing the stairs to its apex... these are only images. It is obvious. But imagines that we can detach, if only for a moment, from the rigid determination of volume and intensity, kilograms and kilometres, minutes and seconds, power and latencies; and bring us back to a consideration as obvious and straightforward, as, alas, it is hostile and misleading.

Charlie Weingroff[7] coined the phrase "Training is Rehab and Rehab is Training". Such a saying coincides with the concept that sees Movement as a central pivot in the processes of Prevention (prehab Training), Correction (Corrective Training or Remedial Training), Rehabilitation (Rehab Training), and Performance (Peak Performance Training, Training Complex, Sports Training, Functional Training, etc.). Concepts and operational areas cannot be separated, they are actually so closely related and connected that they become almost indistinguishable. The reason for such a Syncretic model (merging multiple non-heterogeneous, but Synergistic operational areas because they are engaged in a combined and contemporary action, and Synoptic, because they can offer - to those who work and those who use the work - a complete, overall, and synthetic view), from an essentially motor standpoint, is as we said, due to the following principles:

1. accidents are caused by the way we move (motor control);
2. if we move well (motor control) we can **prevent injuries**;
3. if we move well (motor control) we can **improve performance** (economy, output);
4. if we move incorrectly, uneconomically, without a purpose, the outcome of the performance is "poor", limited, inadequate and, above all, dangerous.[8]

CONCLUDING AND SUMMING UP. OR RETRACING OUR STEPS.

It is impossible to conclude and, as for summing up, well I can try, but I cannot promise a result worthy of the name. "Summing up" in actual fact means to keep talking. To keep searching. In my case, in my very personal and very limited case, it means continuing to explore implied and hidden underlying connections,; or, simple and trivial references that encourage you to search until confusion sets in. And doubts arise. Until new questions emerge.

We have taken **four small steps**. Too few to be able to say that we have completed a path, much less a trip.
All that remains for me is to continue to think; and thinking that it is possible to "move training", shifting the boundaries imposed not by the body, but by thought. I know well that this work is, and has already been carried out by far wiser and learned authors. My small attempt is very modest. The only certainty - you will agree with me - is the awareness of exciting new possibilities. Many of which have already been expressed, already tested; many others already consumed and evaporated; others are still frozen waiting for patient understanding.

Therefore, I do not conclude, but expand the theme and broaden the issues. I do not cross the finish line, I return to the starting line. I return - I more willingly than you perhaps - to **"From the very beginning",** the title of the first paragraph of our journey together, that started 10,000 words ago.

Movement is not an isolated event that "happens" in a plane of movement; but rather a complex event involving synergistic muscles, stabilisers, neutralisers and antagonists; all protagonists, associated and involved in the production of a tri-planar motion (V. Gambetta)[9].
All movement patterns involve "momentary" stages of deceleration, stabilisation and acceleration; and this alternation, synchronous and simultaneous, affects all links in the kinetic chain[10,11,12,13,14,15,16,17]. A kinetic chain aimed at producing movement, guiding it in the three planes of space[18]. Every production of movement is the result of the functional interaction established between three basic elements such as: Strength, Stability and Mobility.

THE DODECAHEDRON.

The Movement produced, or expressed if you prefer, then becomes pure and simple *three-dimensional geometry.*
The human mobile system is constituted by a frame which is structurally based on *six unique functional sets*, which correspond to six shapes or volumes: 1) the head (designed to control and direct the movement; 2) the upper limb (designed for prehension), 2) the lower limb (designed for station and locomotion), 4) the "rocker" of the scapulohumeral joint (designed to stabilise the movement of the upper limbs, 5) the "wedge" of the pelvis (designed to stabilise motion of the lower limbs, 6) the "barrel" of the torso, the seat of the Core (designed to act as a pivot and connection between the lower and the upper half of the system).
These six sets develop their ability to move around **6 pairs of joints**. The large joints are those of the scapulohumeral (2), and the coxal femoral (2). The small joints are the elbow (2), knees (2), ankles (2), wrists (2). These hinges or joints, are authentic "functional and structural junctions", a sorting and regulation hub of efforts between the central axis and limbs. Their sum (12) - that is, the sum of their mutual interaction - generates *a dodecahedron, whose vertices produce trajectories of macro movement.* Each vertex is the point of connection between one link in the chain and the one that follows and it is moved by the functional interaction established between three basic prerequisites: Strength, Stability and Mobility.

These hubs are supported by a servo-mechanism, called the Core, or Centre. As we have said regarding the Form of Movement, the core is a synthesis of Mobility and Stability, it directs myofascial traffic and monitors the actions aimed at achieving a target, a goal, a finalisation, involving units in a comprehensive and overall programme. In addition to the Core, and not far beyond the postural dodecahedron, we can see the three-axle and four-wheel drive functional machine, which we designed in the second article [S & C, Year III, No. 7, January-March 2014, pp. 33-37].
To understand the location and spatial projection of the dodecahedron, I can use three different visions: 1) analytical, to isolate the function of each structural part

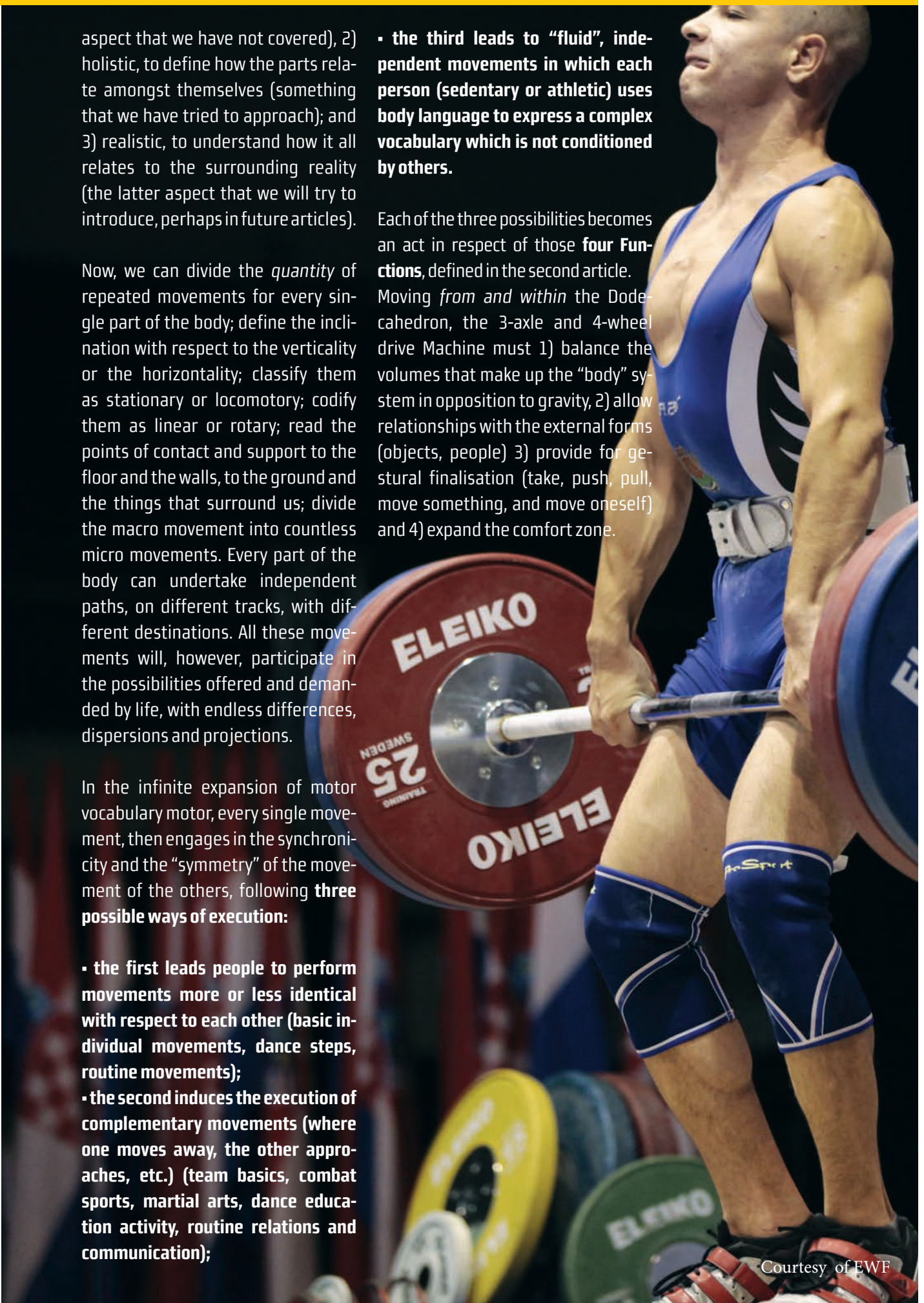
aspect that we have not covered), 2) holistic, to define how the parts relate amongst themselves (something that we have tried to approach); and 3) realistic, to understand how it all relates to the surrounding reality (the latter aspect that we will try to introduce, perhaps in future articles).

Now, we can divide the *quantity* of repeated movements for every single part of the body; define the inclination with respect to the verticality or the horizontality; classify them as stationary or locomotory; codify them as linear or rotary; read the points of contact and support to the floor and the walls, to the ground and the things that surround us; divide the macro movement into countless micro movements. Every part of the body can undertake independent paths, on different tracks, with different destinations. All these movements will, however, participate in the possibilities offered and demanded by life, with endless differences, dispersions and projections.

In the infinite expansion of motor vocabulary motor, every single movement, then engages in the synchronicity and the "symmetry" of the movement of the others, following **three possible ways of execution:**

▪ the first leads people to perform movements more or less identical with respect to each other (basic individual movements, dance steps, routine movements);
▪ the second induces the execution of complementary movements (where one moves away, the other approaches, etc.) (team basics, combat sports, martial arts, dance education activity, routine relations and communication);
▪ the third leads to "fluid", independent movements in which each person (sedentary or athletic) uses body language to express a complex vocabulary which is not conditioned by others.

Each of the three possibilities becomes an act in respect of those **four Functions**, defined in the second article.
Moving *from and within* the Dodecahedron, the 3-axle and 4-wheel drive Machine must 1) balance the volumes that make up the "body" system in opposition to gravity, 2) allow relationships with the external forms (objects, people) 3) provide for gestural finalisation (take, push, pull, move something, and move oneself) and 4) expand the comfort zone.



Courtesy of EWF

AN IDEA AS OLD AS TIME.

These sets (6 shapes, 6 pairs of joints, 1 centre, 3 performance possibilities, 4 functions), in combination, thus allow an almost infinite proliferation of movements. Movements, despite being rigidly bound to the degree of freedom allowed by joints (points of discontinuity) and creating problems to the apparent "continuity" of motion, can still be harmonised with one another.

What do we mean by harmonised? Figuratively proportionate to the space covered, rhythmically consistent with the time taken to cover it, economically and aesthetically suitable for the purpose that leads to the "coverage" of space in a given time.

Why does movement need to be harmonised? To produce uninterrupted **Sequences, Bonds, Flows** to guide the renovation of primordial motor elements, attributable to an unchanged ontogenetic development, until the redevelopment of current motor elements, the result of gradual phylogenetic evolution (or devolution). Strange, incomplete, and unconventional. But definitely **"beyond training"**.

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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.

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OSGOOD-SCHLATTER DISEASE IN WEIGHTLI-FTING

The authors illustrate the characteristics of a pathologic inflammatory condition that affects the insertion of the patellar tendon on the tibia and that affects individuals at a young age, practicing sports that involve the extension of the quadriceps muscle under load.
They discuss the causes of the disease, its pathogenesis and related symptoms, as well as the possible treatment and the prognosis which is almost always benign.

BY NICOLA VOGLINO, ANTONIO URSO

Courtesy of EWF

The official journal of the European Weightlifting Federation

Osgood-Schlatter disease is an inflammatory medical condition that affects the tibial insertion of the patellar tendon. It affects young people practicing sports that involve jumping, running, leaping which, in general, involve the extension under load of the quadriceps femoris muscle.

CAUSES

Osgood-Schlatter disease is one of the most common causes of pain and swelling of the knee in adolescents who practice sports. It is classified as a disorder or a condition occurring in individuals undergoing bone growth, characterised by a tendinitis of the distal patellar tendon associated with osteochondrosis (suffering cartilage) of the tibial apophysis. **(Figure 1 tendinitis and osteochondrosis)**

This pathological condition was described in 1903 by Robert Osgood, an American physician, and Carl Schlatter, a Swiss surgeon.

It is a disease with a definite period of onset ranging from 10 to 15 years of age; usually affecting the dominant knee, and more common in males with a male to female ratio of 3:1.

Osgood-Schlatter is the result of a continuous and repetitive effect of traction of the patellar tendon on the growth plate of the tibial tuberosity and should be properly distinguished from patellar tendinitis that occurs mainly in adulthood.

It had always been thought that the predisposing cause of Osgood-Schlatter disease was the prolonged use of flexion-extension under load of the quadriceps femoris muscle, in athletes who train and compete on 'hard' surfaces such as parquet (volleyball, basketball, fencing), cement or mateco (tennis), synthetic or pozzolana (football). The concept of consistency of the competition surface was associated with the concept of the activity of movement and jumping. That is, until a few years ago, it was thought that the disease may arise only in athletes engaged in running or jumping. However, observation of the presence of Osgood-Schlatter disease in athletes practicing water polo, weightlifting, wrestling or even in sedentary individuals, gave new impetus to the study of the disease.

Still today, the causes and treatment of Osgood-Schlatter disease are the subject of scientific discussion.

PATHOGENESIS

It is currently agreed that the frequent use, during exercise, of the quadriceps femoris muscle is the most common cause.

Anatomically, the quadriceps femoris (the anterior thigh muscle) is a four-headed muscle: the rectus femoris, the vastus lateralis, the vastus medialis and the vastus intermedius. The four muscle heads are inserted into different bone segments in the pelvis, whereas below they converge into a single tendon called the Quadriceps Tendon, which incorporates the patella and continues up to the tibial tuberosity, forming the Patellar Tendon.

The Patellar Tendon therefore, functions both as a ligament connecting two bone segments, the Tibia and Patella, and an insertional tendon of the knee's extensor muscle group.

The difference between the tendon and ligament is very important and undoubtedly plays a significant role in the onset of the Osgood-Schlatter disease. Without going into histological details, we can say that the main characteristic of tendon structure, combining the muscular component with a bone segment, is its elasticity, along with increased vascularisation, while a ligament connecting two bone heads, must have great tensile strength with a smaller component of blood vessels, thus less blood supply. A more vascularised tissue (tendon) has the ability to heal, to cicatrize more than tissue which is not as vascularised (ligament).

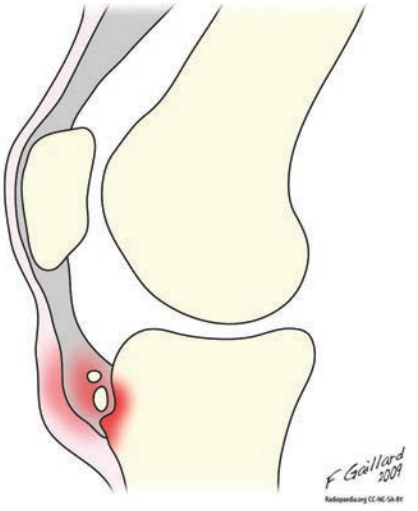

FIGURE NO. 1
TENDINITIS AND OSTEOCHONDROSIS

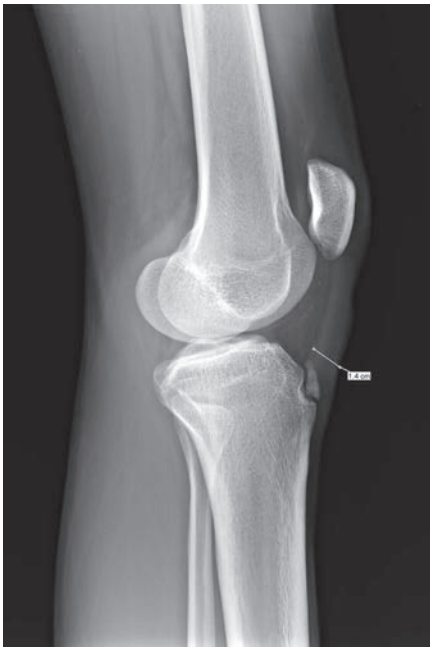

FIGURE NO. 2
OSGOOD-SCHLATTER DISEASE WITH THICKENING OF THE PATELLAR TENDON

The continuous and repeated use of the quadriceps femoris muscle causes repeated microtrauma of the patellar tendon at its insertion on the growing tibia. The tibia, although still growing, is strong enough to withstand the tension of the patellar tendon. The distractive force exerted by the patellar tendon on the periosteum and bone causes redness (hyperemia), followed by the cha-

racteristic swelling of the tibialis anterior, below the knee, precisely at the point of insertion of the patellar ligament. As already seen, the distal insertion of the patellar tendon has more ligament than tendon characteristics resulting in less blood supply, causing minor healing ability and therefore inflammatory process becomes more chronic. **(Figure 2 Osgood-Schlatter Disease with thickening of the patellar tendon)**

SYMPTOMS

The main symptom and the first to appear, is pain in the anterior tibial apophysis, below the knee, in the anatomical region of the distal insertion of the patellar tendon. The symptoms appear very gradually and the athlete complains of pain around the tibial tuberosity, after exercise. The severity of pain is variable; it worsens during and immediately after exercise and tends to regress during functional rest. Normally the pain lasts a couple of months, but often persists until growth has been completed (1-2 years). A painful, hyperemic swelling, which does not extend to lower areas, may develop at the tibial insertion of the patellar tendon. The swelling is permanent, it tends not to regress in terms of volume and texture.

Over months it becomes asymptomatic, and the pain regresses. Swelling in Osgood-Schlatter disease is extra-articular, therefore the articulation of the knee is not compromised, and does not alter the length and therefore the resistance of the patellar tendon.

The diagnosis of Osgood-Schlatter is clinical, meaning the set of anamnesis (young active, athletic patient), signs (swelling, redness) and symptoms (pain) are sufficiently clear to the medical specialist in order to make a diagnosis. It is frequently associated with a radiography of the knee that can highlight a small osteochondral fragment (a small flake) detached from the tibia by traction exerted on the patellar tendon. **(Figure 3 "Small Flake" in the context of the patellar tendon).**

Depending on the severity of the disease and especially the persistence of symptoms over years, it may be a good idea to combine a radiographic study with an ultrasound and MRI.

FIGURE NO. 3
"SMALL FLAKE" IN THE CONTEXT OF THE PATELLAR TENDON

TREATMENT

The aim of treatment is to reduce pain and return the knee function to the young athlete, in order to resume the sport of choice.

Treatment of Osgood-Schlatter disease includes:

- **Reducing sports activity.** It is almost never necessary to completely suspend the sport that caused the symptoms. Indeed, often, a total suspension of the activity, with a consequent decrease in tone and mass of the quadriceps muscles, may cause a worsening of symptoms. During periods of acute pain, specialists advise to reduce activity, alternating with rest of the functional joint.
- **Cryotherapy.** Therapy with ice, for 20 minutes, several times a day and after training sessions, is recommended.
- **Anti-inflammatory therapy.** Therapy with NSAIDs, particularly ibuprofen and acetaminophen, is recommended although it is not yet clear what the actual local action of the drug. The greatest effect is most likely anti-inflammatory and partially anti-edema, with pain reduction due to the decrease of the infarction of the inflammatory liquid.
- Infiltrative therapy. Local infiltration with steroids (cortisone) or with local anaesthetic is absolutely not indicated.
- Orthopedic supports. The use of a knee brace can be taken into consideration to rest functional articulation for short periods of time, when the pain symptomatology is particularly acute. It is not indicated, for lack of scientific evidence, the use of a strap for the patellar tendon.
- **Orthotic Insoles.** Baropodometric, static and dynamic and gait analysis tests should be carried out prior to using bilateral orthotic insoles.
- **Stretching.** Extensor stretching exercises may be recommended when the symptoms are in the withdrawal stage.
- **Physiotherapy.** Ultrasound low intensity therapy combined with TECAR has a specific indication in the treatment of Osgood-Schlatter disease.

It is important to note that Osgood-Schlatter is a self-limiting disease and that, generally, complete resolution of the clinical picture is obtained in about a year. The risk of tendon rupture is almost nil.
Very rarely in this disease, must the patient resort to surgery. In very few cases, carefully selected and resistant to any therapy, it is indicated to surgically remove the fragment or the tibial cortical bone fragments in the lesion due to the traction of the patellar tendon

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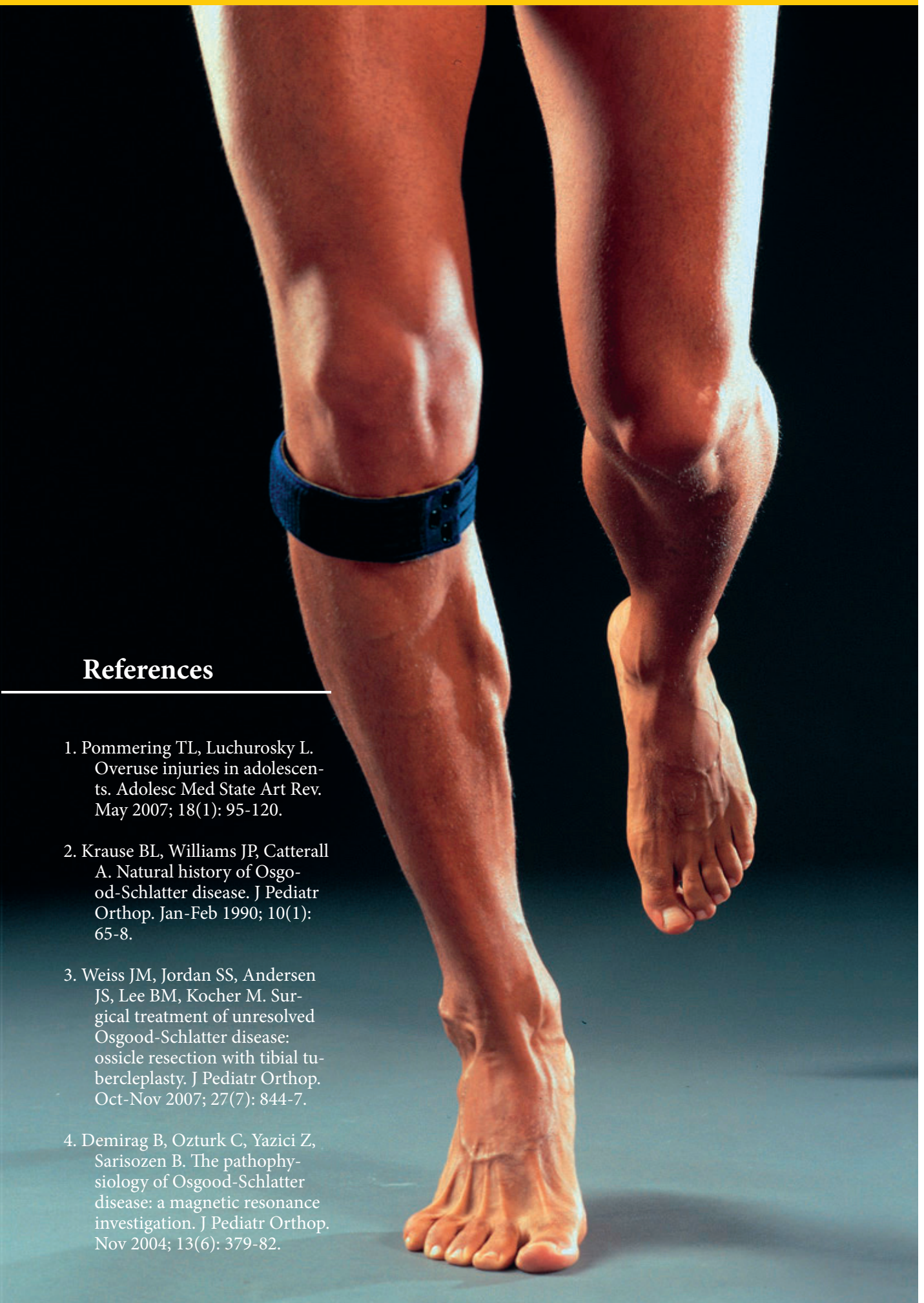

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WHEN SIZE REALLY MATTERS

BY MENOTTI CALVANI

A **certificate of good health** is required when applying for a job in the civil service. It is also required when joining a gym to practice non-competitive activities to prove a good physical constitution. The word *constitution* is seemingly intuitive and yet it has only recently been introduced into the medical field. Constitution implies finding a relationship between the physical fitness and performance of an individual, a concept that gives us an idea of what sport can be played best by individuals based on their height, muscle mass, size of limbs, chest and abdominal circumference, etc.

Physical structure was important for recruitment in the ancient Egyptians army; The Romans demanded that the knights and soldiers on the frontline be at least 172 cm tall, while those on the second lines had to be at least 164 cm tall. But what mattered more than height was undoubtedly **strength** … (Vegezio Publio Renato, IV-V century *De re militari*).

Height, strength, but what should be the measurements of a healthy man? One of the first attempts at a description of harmony was made by **Leonardo da Vinci** with his Vitruvian Man, a drawing in which the chest is one-fourth of his height, the head is one-eighth and the face one-tenth. *"Now the navel is naturally the exact centre of the human body; for if a man be placed on his back, with his hands and feet extended, and a pair of compasses centred at his navel, the fingers and toes of his two hands and feet will touch the circumference of a circle described therefrom* **(Vitruvius, De Architetura)**; *«similarly, his height is equal to his arm span»* **(Leonardo da Vinci)**.

Among the first to deal in recent times with the relationship between physical structure, the probability of disease and motor skills, was the Italian, **Achille De Giovanni** (1838-1916), who was convinced that *"form and function are intimately related as strength is related to matter"*. To him we owe the first steps towards the definition of normal build: in which the ratio of height and circumference of an individual's chest is about 1.87. A value lower defines short-limbed, while a higher value indicates long-limbed.

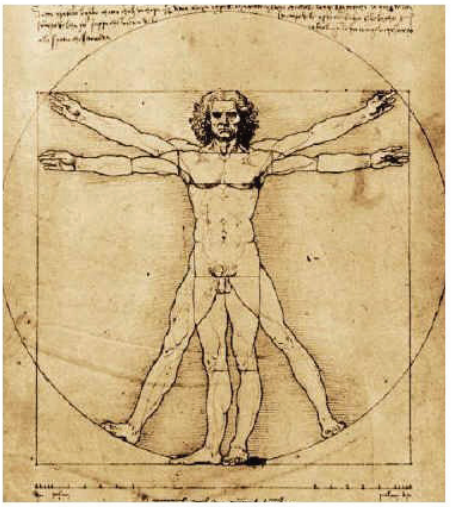

FIGURE NO. 2
LEONARDO DA VINCI'S VITRUVIAN MAN

In 1940, an American, William Herbert Sheldon published a book entitled *"The Varieties of Human Physique,"* and in 1954, *Atlas of Men: A guide for somatotyping the adult man at all ages*, in which he describes three main constitutional types. His classification is inspired by the three germ layers from whi-

FIGURE NO. 1
ATHLETES, A WORLD OF PHYSIQUES AND PERFORMANCES

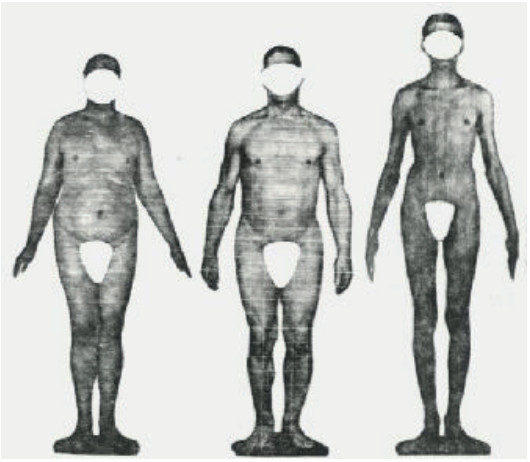

FIGURE NO. 3
SHELDON'S BIOTYPES IN A PHOTO FROM HIS BOOK ATLAS

ch the future organism is generated: the *ectoderm* which generates the skin and the nervous system, the *mesoderm* that gives rise to the musculoskeletal apparatus and heart, the *endoderm*, which generates the digestive tract. Sheldon differentiates his subjects based on the contribution of the three layers to the final structure, and does so by using photos of freshmen, boys and girls, from the group of Ivy League universities (Yale, Princeton, Smith), who had agreed to pose naked for posture studies.

Sheldon subdivides his basic biotypes into three groups:

- **Endomorph:** individual with a high proportion of fat tissue, wide waist and big bones;
- **Mesomorph:** individual with medium bone structure, wide shoulders, narrow waist, low body fat levels;
- **Ectomorph:** long limbs, low body fat levels, thin.

Sheldon also attributes to his biotypes the psychological characteristics that do not always attract positive criticism. A more enduring aspect of his study, on the other hand, was the consideration that the biotypes received from strength coaches who have used them to customise training programs, adopt individual nutritional patterns, often with good results. Sheldon's biotypes were attributed with playing a role in certain inclinations for specific sports. Endomorphs are more suitable for contact sports such as rugby, but also weightlifting. Mesomorphs would seem to have evident abilities for physical activity in general and achieve excellence in power sports such as weightlifting, bodybuilding and endurance events. Ectomorphs are suitable for all sports in which jumping is an essential part (basketball, volleyball, soccer) or in sprinting.

In 1995, the New York Times reported that thousands of photos of naked students of the IVY League Universities had been found in the archives without any protection for privacy. Among the students were the names of important people: **George Bush, Hillary Clinton, Meryl Streep** ...; the scandal was quietened by the Smithsonian Institution's decision to destroy all the pictures!

Like father, like son. It is common belief that physical characteristics are linked to the genetic transmission between parents and children. In some sports, such as horse riding, there is a profound conviction that performance skills are inheri-

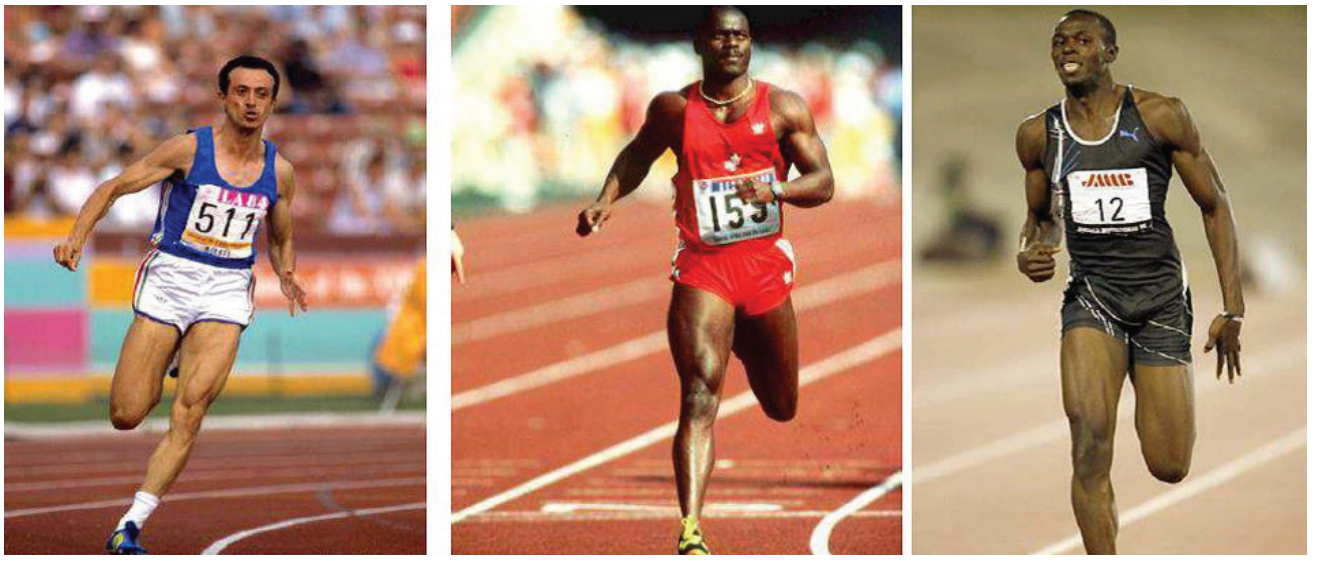

FIGURE NO. 4
IDENTICAL SPORT AND SAME BIOTYPE?

FIGURE NO. 5
PRIVACY AT RISK FOR SHELDON'S SUBJECTS

FIGURE NO. 6
RIBOT AT THE ARC DE TRIOMPHE

ted and that champions cannot be other than the children of champions: thoroughbreds.

In human beings, genetic extraction is quite different and while champions do sometimes run in the family, it is not always the case.

Biodiversity in humans is important, indispensable, but how important is genetics in determining the structure of an individual? Undoubtedly very important, but recent data shows that the embryo and subsequently the fetus, have certain degrees of freedom in the construction of its final structure. The size of the newborn generally relates to the size of its mother, but nutritional deficiencies in the mother's diet, especially in the last quarter, determine a decrease in the child's growth. Infants with a low birth weight have a reduction in the number of muscle fibres and a reduced number of nephrons, the underlying structures of the kidney's functioning. Once they become adults, these children have an increased risk of becoming obese and hypertensive. Very often, overweight individuals are subjected to high-protein diets for weight loss without investigating their birth weight, with the risk that the reduced number of nephrons exposes them to increased risks of kidney damage. Before starting a high protein diet, knowledge of birth weight is essential also for non-obese individuals and for those who wish to increase their muscle mass.

During pregnancy, the growth rules of the baby, dicta-

ted by the genes of the baby's parents, are regulated by the womb that **"trains"** the future newborn to function in the best way under the conditions of nutrition and stress present in the external environment, with the mother acts as the sensor. New information is added to the software present in the genes, that will impact **("Programming")** on the structure of the individual as it matures. The events that both mother and child experience (deficiencies, abundance of food, chemical, physical, environmental agents, etc.) can modulate performance **("Conditioning")** of the building program planned in the DNA.

The first **trainer** in our lives is our mother, but today we are discovering other periods of programming, such as the first year of life, however, scientific evidence shows windows of programming of our bodies throughout our whole lives.

Obesity characterised by an excessive accumulation of adipose tissue and a reduced amount of muscle fibres at birth, are two of the possible consequences of particular conditioning during fetal life. Both are critical to health and to life expectancy. Today, they can be monitored with instruments tools to quantify the **body composition** and thus reshape the structure and functioning of our body to extend and improve the quality of our lives.

FIGURE NO. 7
THE "MALDINI" FAMILY AND ABBAGNALE BROTHERS

FIGURE NO. 8
OUR MOTHER IS OUR FIRST TRAINER

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DOPING AND GENE DOPING: THE ETHICAL APPROACH

Every male or female athlete's goal is to stretch, time after time, their physical boundaries and to outperform themselves, as well as their competitors. Our culture is replete with notions and mottoes that tend to influence athletes, encouraging them to achieve higher goals and to exceed expectations.

BY SOFIA A. MATSAGKOU


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INTRODUCTION

Every male or female athlete's goal is to stretch, time after time, their physical boundaries and to outperform themselves, as well as their competitors. Our culture is replete with notions and mottoes that tend to influence athletes, encouraging them to achieve higher goals and to exceed expectations. How and at what point should the issue of ethics be raised along these lines? Why should this standard affect our decisions, or how are the latter an outcome of ethical evaluation? Why should pharmaceutical doping and gene doping concern us from an ethical point of view?

THE CONCEPT OF ETHICS

Since the very first Olympic Games, the core reason for inflicting penalties was, essentially, the motivation to commit fraud –not the detection of banned substances, as is the case today. The ancient Olympic Games were governed by the notions of fair play, sportsmanship, the Olympic truce, camaraderie, justice, and athletic ideals. In fact, the penalties applying during that era were quite different from those that are in effect in our days. However, the competent authorities have always acted with a view to promoting athletic ideals and principles in a manner that would cater to the moral values of their contemporary civilization.

THE NEED FOR ETHICS IN SPORTS

The concerns, on which we will expound, arise from issues such as interference with athletes' health, limitations on autonomy and freedom, lack of justice, as well as the fact that doping runs counter to the purpose of doing sports, to the athletic ideals, and to the Olympic principles. Concerning the issue of interference with athletes' health and safety, we should note that doping is not the only way to cause damage to athletes' health; however, it is the only one that is banned. Nevertheless, it is a widely held opinion that the risks entailed by athletes, in their pursuit of awards and victory, may be deemed permissible to the degree that they are indeed tolerable. We may therefore build three evaluation criteria models in order to best approach our evaluation: the utilitarianist model (which includes two types of consequentialism, namely the "egotistical" type and the altruistic type; the case of pharmaceutical doping falls into the first type, as it yields no benefit for the largest possible number of people), the model of criteria "for the benefit of others", and the hedonic model (in which, according to Mill, pharmaceutical doping could not possibly be numbered among the qualitatively higher pleasures, since it doesn't satisfy neither the intellect nor the moral sentiments). In conclusion, the use of doping is non-permissible from an ethical point of view; it is also illegitimate on the grounds that it poses risks against an athlete's health, since none of the three criteria of these particular ethical concerns is fulfilled. The athlete's autonomy in the use of doping may be examined through the definition of ethical boundaries concerning the limitation of freedom. This will lead us to consider the 'do no harm' principle, the offence principle, and the legal moralism principle –similarly, the collective goods principle, the need principle, and the fairness principle. The 'do no harm' principle is being violated, because the athlete's act –and, by extension, the athlete himself– harms spectators, organizers, and competing athletes. The offence principle is equally violated, because the athlete who uses doping affects, through this act, both his competitors and the spectators. He also causes financial damages to himself, if he is covering the expenses of his illegal regime; in the moral plane, he offends himself by violating athletic rules, as well as legal rules in general, as established by his country

and by WADA. Finally, in regard to legal moralism, a feeling of repulsion is experienced by the people in the doped athlete's environment who are espousing the prevailing, conventional moral standards. However, even if this act causes no harm to anybody, the common feeling holds it as immoral and as diverging from mainstream behavior. We should thus accept that the act of doping limits another athlete's autonomy in participating in athletic contests; consequently, the freedom of an athlete getting doped should be restricted. Therefore, a limitation of freedom may be legalized for the aforementioned reasons. Concerning the fairness or unfairness of the use of doping on the grounds of justice, we should examine three different instances. First, the advantage enjoyed by certain athletes, who can afford the financial burden of using substances or methods designed to improve their performance, over other athletes who do not possess the necessary funds. Second, the issue of justice against those athletes who do not resort to doping and who compete, unknowingly to them, within an unfair environment, compared to the ones using doping. Third, the fact that some athletes are, by nature, more muscular or fitter for certain sports, compared to their competitors. In conclusion, the first instance does not raise an issue of justice, albeit it does raise one of inequalities. The second instance raises issues of benefits and rights, in which case the state has the responsibility to intervene –therefore, the principle of justice is violated. The above claim is further supported via the description of intrinsic and derivative values.

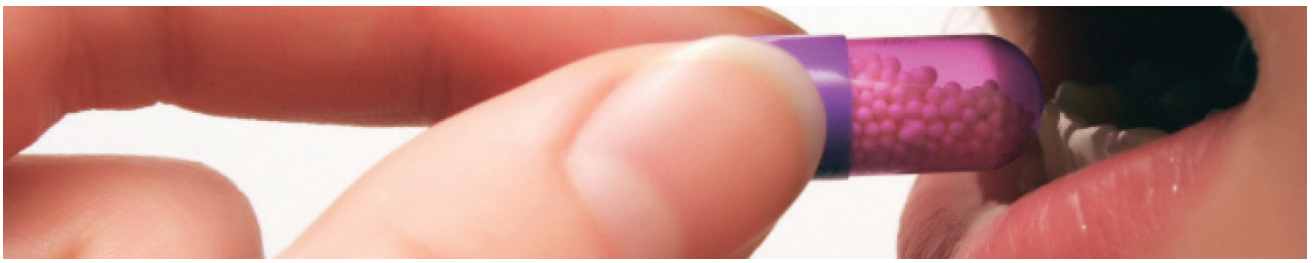
According to Dworkin, detached values[1] do not stem from the interests of certain persons; they are "intrinsic" values. On the other hand, derivative values refer to issues regarding the fulfilment of one's rights and benefits. A number of philosophers have questioned whether there exists something possessing an intrinsic value[2]. Sports possess an intrinsic value, since they do not only serve benefits; they also serve desires[3], as is the case with arts and music. Neither does the third instance raise an issue of justice, because natural heredity does not raise issues of rights and benefits and, therefore, it does not justify state intervention. Finally, "sports ethics" depends on the rules of each sport, as well as on the values that the use of doping may alter or destroy. This position is supported by the spirit of the Olympic Games –a free spirit, devoid of national, political, financial, and other commitments. Summarizing, we could say that sports are a social and cultural good with a strong pedagogical character, referred to as the overall purpose of participation in athletic contests, and incompatible with the use of doping[4].

GENE DOPING FROM AN ETHICAL POINT OF VIEW

The issue of gene doping will also concern us, since IOC[5] and WADA[6] first got interested in it back in 2001; a couple years later, in 2003, WADA included the term "gene doping" in its list of banned substances and methods.

In general, man's actions should be driven by a certain mental content that tends towards beauty, general interest, and nature; he should also aspire to the natural, unmedicated development of his innate inclinations. This can be achieved in a manner that does not utilize other human beings as objects, but as rational creatures who are able to universalize their critical thought and to promote their will, thus resulting in what can be fully defined as the "human species" in general. Therefore, genetic modification with the aim of gene doping equals with the utilization of man as a means to achieve a purpose that is not beneficial for humanity. In this way, the athlete makes a tool of himself, thus undermining his own dignity by not respecting his singularity within nature. In this case, where man is not interested in his own inner culture and his ethics, the principle of justice should apply with the goal of penalizing unjust acts perpetrated by athletes against their fellow citizens, the athletes they compete with, and the spectators.

To better understand how an "end-in-itself" can be justified, we should refer to Kant, according to whom, since man has the ability and the authority of a co-legislator within the "kingdom of ends", he also has the ability to impose moral laws on himself[7]; furthermore, ethics itself views a potential kingdom of ends as a state of nature –precisely due to the fact that a kingdom of



ends involves "ends-in-themselves" and, consequently, rational creatures[8]. A state of nature would have its own laws, rules, and sets of criteria that would serve to promote the rights and benefits of its citizens, to allow them to express their opinions and beliefs, to respect and value their efforts and interests. Such a state of nature might look like a smaller-scale contemporary democratic system. Thus, an athlete's purpose in using gene doping can be characterized as a part of his will that does not think or act in a honest and virtuous way for the benefit of competing athletes, spectators, or even his compatriots. The ability of participating in athletic competitions –especially when these involve financial motives for the personal fulfilment of the athlete in question– should also, according to Kant, depend upon public acknowledgement by the spectators, the competing athletes, or society in general, if it is to be viewed as promoting their benefits[9].

According to John Rawls, for whom justice can be described as the rules upon which society is structured (a society in which there is a real possibility for harmonious co-existence, co-operation, even a certain amount of competitiveness, despite any differences concerning the values and purposes of life) if we create a society similar to the one described here, but whose content is athletic, we'll also come to the aforementioned conclusion. More specifically, such a society would be structured as follows: let us suppose the existence of a state called the "Republic of Athletic Ideals"; its citizens are the persons occupied in the sports sector, e.g. athletes, coaches, sports medicine physicians, etc. Said Republic would be comprised of three separate powers –namely, the legislative, judicial, and executive powers. The legislative power is comprised of the committees whose work consists in establishing the penalties and the bans of athletes found with a positive sample and in compiling the regulations and lists of banned medications and substances. Then, comes the judicial power, under which the violators of rules would be judged; this one will be responsible for pronouncing their penalties. Finally, the executive power will be concerned with the supervision of how the rules are observed by all "citizens". After structuring our new society in such a simple way, we should set a starting point. This starting point may be that the regulations of this society are accepted by all citizens on the grounds of complete agreement or of "tacit consent" (Locke). Our new Republic is legitimized to govern its citizens on the basis of the oaths given by the participants (athletes oath, judges oath, oath of sports medicine physicians, legal obligations of coaches, etc.), since, through their oaths and through their "abidance" in it, they have ceded these powers to their Republic. Consequently, we may strengthen our position by claiming that the citizens are wittingly residing in this Republic, as every elite athlete would have signed a document displaying his physical residence, the number of days and time period, etc., as requested by the competent authority[10]; this signed document would then be sent to the National Anti-Doping Council in effect (and, by extension, to the World Anti-Doping Agency). In this way, enhanced genetic differences are no worse, from the perspective of justice, than natural[11] differences and, even though a genetically enhanced athlete might have an illegitimate advantage over his non-enhanced competitors (something that is morally reprehensible), this is not due to reasons of justice[12]. As for the Republic of Athletic Ideals, we could say that this is the international democratic community in which those directly involved in sports and in sports ethics are participating. One more problem that could emerge due to genetic improvement is the undermining of human species itself via its permanent modification. Man's ability to achieve his goals based on his natural powers (that is, the powers he is able to cultivate up to a certain point) can be devalued and, ultimately, lost. This may drive man to consider himself worthy of distinctions that are utopic and to undermine his responsibilities regarding his own identity and his actions[13].

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CONCLUSIONS

These ethical concern should understandably be of interest; the use of pharmaceutical doping and of gene doping is not considered ethical, since there is a number of principles –such as the principle of effectiveness (competition between athletes during games), the principle of collegiality, the principle of duty to oneself, the principle of the right to health– as well as a number of intrinsic values –such as nature, self-worth, and dignity– that are violated or annulled. All the above aim at leading us to a kind of investment in human life itself, both between those living concurrently and between generations to come –an investment that the permanent modification of human species is bound to annul. Notwithstanding, athletic "spirit" is defined by the athlete's "spirit" itself, and it is governed by values such as fair play and honesty, excellence of performance, character and education, devotion and commitment, respect to rules and laws, self-respect and respect towards our fellow athletes, courage, and collegiality[14]. These should constitute a set of fundamental values for athletes and for those practicing a sport. The above principles should attach real meaning to the essence of sports and of top-class sports; they should also constitute a part of the educational process offered to teams and to individual athletes.

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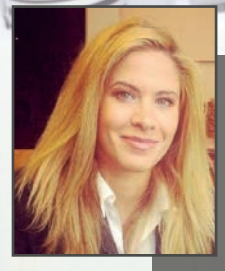

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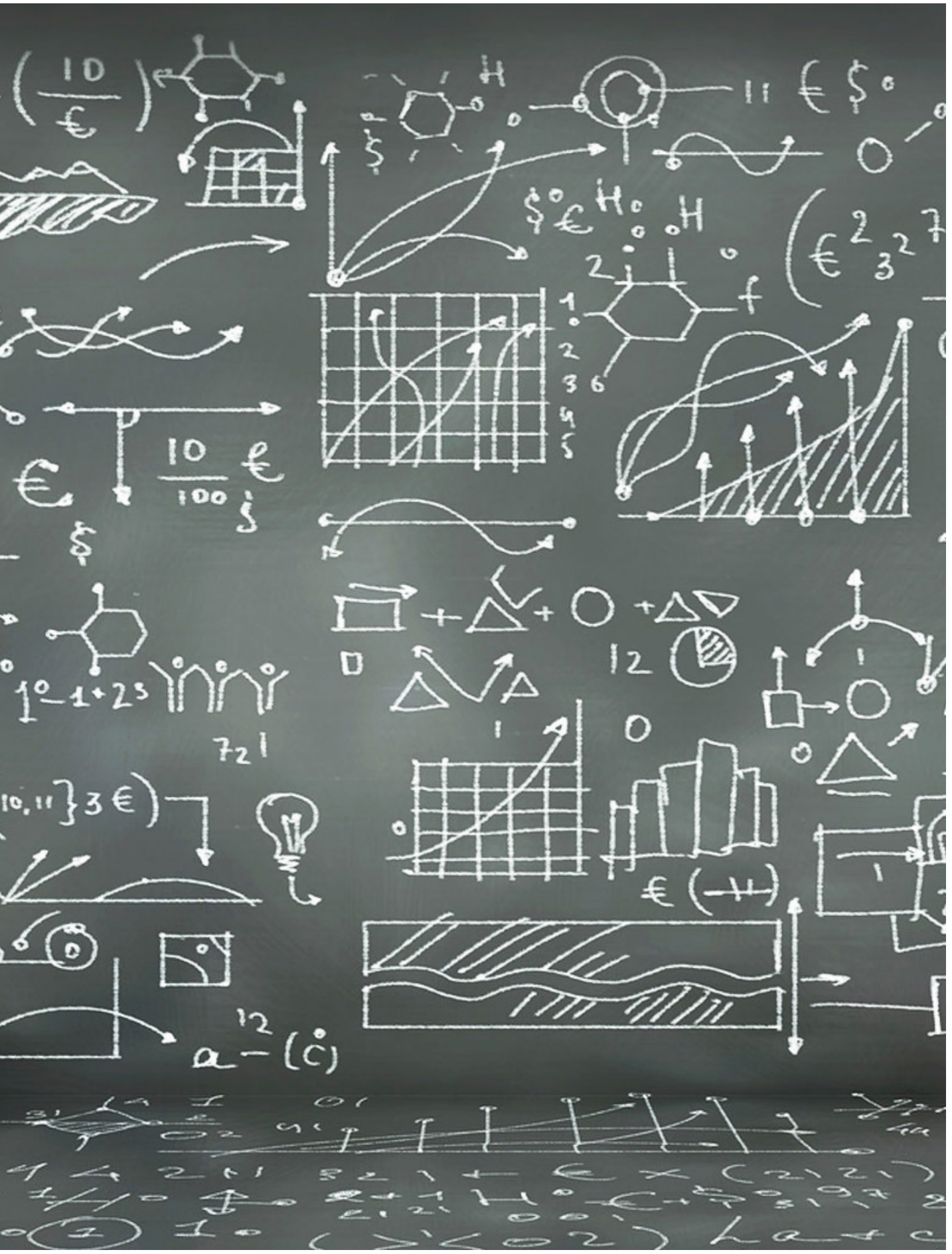
The official journal of the European Weightlifting Federation

COM-PLEXITY AND SPORT

BY FABIO BAGARELLO, FRANCESCO GARGANO, FRANCESCO OLIVERI, SALVATORE SPAGNOLO



The Complexity theory and its foundations

Recent decades have seen an ever increasing popularity, both in empirical sciences and in social sciences, in techniques and mathematical instruments for the investigation of so-called *complex systems* [1, 2, 3, 4, 5, 6, 22, 23].

Attempting to define the complexity of the phenomenon in a clear and all-embracing way remains a difficult task as the subject is too "young" from an epistemological point of view, and due to its cross-application to a variety of areas that has led to the emergence of different schools of thought. Nevertheless, in order to establish ideas, we can attempt to highlight, without being exhaustive, some peculiar common aspects. Complex systems have widespread relations between heterogeneous components that interact locally; they are free from any general controller that rules or uses the interactions between the parties to drive the evolution of the system towards some form of pre-established objective; they possess a more horizontal than hierarchical organisation, with many types of inter- and retro-action; they are subject to a continuous adaptation through processes of evolution of the individual parts; they manifest dynamics that are often in states far from equilibrium, or that may provide many states of equilibrium or even none at all; they are subjected to new external stimuli, reacting by creating new dynamics, which are completely unpredictable and beyond control. In short, in a complex system *the whole is greater than the sum of its parts*. In common practice, it very often happens that we meet a complex system. For example, under certain conditions, we can observe demonstrations of complex dynamics in city traffic, in a crowd of people in an urban development, in weather systems, in a flock of birds or a termite mound, on the stock exchange, in the nervous system or the immune system. Today we know a huge number of complex systems and over time we have learned to recognise and investigate them and to describe them qualitatively and quantitatively in a very often deep and refined way.

It should be specified that in science, the term *complex* is clearly distinguished from the term *complicated*. In etymological terms, the term complex (from the Latin *complexus*, past participle of the verb *complecti*) means to weave several times and can also be used figuratively to refer to an object or a system composed of several interconnected and interdependent parts. The term complicated (from the Latin *complicatus*, past participle of the verb *complicate*) means instead to fold together, to fold over. In this sense, the term can be used to refer to objects or intricate systems that can be explained and understood, however, this feature is not guaranteed for complex systems. Difficult as it may be, the behaviour or the dynamics of a complicated system can be explained starting from the behaviour and interactions of the individual parts that compose it. In a sense, one can say that a complicated system does not hold great surprises for those who observe it: a watch may be conceived in the most complicated way possible, but its purpose, by definition, is to provide the time, and the manufacturer has always full knowledge of how this is achieved. Regarding a complex system, the question is very different. In fact, the behaviour or the dynamics of a complex system are a result of the "sum" of the behaviour or the dynamics of the individual parts, because a complex system typically manifests *emergen*t, not controlled (much less predictable) characteristics in the individual components of the system itself. Probably one of the most interesting examples of emergent properties in complex systems is given by the transition from quantum to classical mechanics when describing a set of atomic particles that make up a macroscopic body. Since the early decades of the twentieth century, we know that the behaviour of particles of micro (10-6 m) and nanoscale (10-9 m), for example electrons, protons or atoms, is described by a branch of physics that is called quantum mechanics, a discipline founded on certain principles developed from stringent experimental evidence. Among these laws, the best known is undoubtedly Heisenberg's uncertainty principle [1]. According to this principle, in the micro and nano-scale world it is not possible to measure simultaneously and with high accuracy, the position and velocity of a particle, even being able to ideally neglect experimental errors. Nevertheless, the objects which we normally encounter in everyday life, made up of a huge number of atoms (a normal glass of water contains about 1025 atoms!), quite clearly show the pro-

perty of having position and velocity simultaneously determined. In a certain sense, by putting together a large number of particles whose position and speed are not simultaneously determinable, we obtain an emergent property (precisely the simultaneous determination of position and speed) of the compound object that exhibits a behaviour not directly related to that of its components. Another example of an emergent property is obtained from the social behaviour of a flock of starlings [6]. During the period of migration of these birds, we can often witness an authentic dance in the sky: a huge number of starlings, in response to some external stress, can perform complex choreography without a leading coordinator. Studies carried out using the tools provided by the complexity theory, show that this complex dynamic emerges from a very small number of simple rules followed by each single starling: **1) mimic the behaviour of the nearest birds, 2) maintain their direction at the same speed, 3) try not to hit against their neighbours.** The social behaviour of ants, termites and bees, for example, is often based on the same type of mechanism: very simple rules respected by every member of that group have resulted in the emergence of a complex behaviour of the whole. Other fascinating examples related to this property are evident in the manifestation of the arrow of time in physics systems [1], the Game of Life by J. Conway [6], or by Lindenmayer systems [7] in which simple grammatical rules (very often recursive) and appropriate graphic semantics of the symbols involved, produce complex objects that simulate the growth of living organisms and allow the creation of extremely realistic artificial landscapes. In general, we can say that a system is as complex as the number of parameters that are necessary for its description and as the number of (non-linear) relations between the parameters involved: it thus depends both on the model used in the description and on the variables taken into account. The main goal of the complexity theory is to understand the behaviour of complex systems, characterised by so many elements which are different to each other, as by numerous, non-linear connections, in other words, with interactions not simply directly proportional to the parameter or parameters chosen to describe the system. In this sense, many systems are complex, and we can only understand by choosing to overlook aspects that seem of little importance or about which there is insufficient information. Given a certain phenomenon, the models that we can build depend on the aspects that we desire or that we can describe with accuracy, and on the information that comes from the analysis of the phenomenon itself. As mentioned, today we know a very large number of complex systems for which some mathematical description is available in literature: social relations, stock markets, the dynamics of species and migration, ecological systems, games theories, political alliances [8,9,10,11,12]. Specifically, those who deal with complexities investigate to see if common elements can be interpreted in mathematical terms so as to roughly describe the evolution of a complex system. In fact, even if from a merely epistemological point of view, for leading living

philosopher of complexity, Edgar Morin [13], *"Science can detect local changes, but it cannot predict a future state of the system considered in its entirety. [. . .] in complex systems, unpredictability and paradox are always present and some things remain unknown"*, from the scientific point of view we are not deprived of the opportunity to mathematically capture important aspects of a complex phenomenon and to quantitatively describe some evolutions. The study of this type of systems (those that appear to be more present in the world around us) has led to a profound revision of the reductionist attitude (i.e. the study the behaviour of a system conceived as the sum of its parts) inherent in some way in post-Galilean science [3,4].

MATHEMATICAL MODELS APPLIED TO SPORT

When it comes to sports, there is no doubt that we have to engage with the theory of complex systems. In this context, the obvious question concerns the possibility of constructing a mathematical model for the description and understanding of sports performance and the chance to make some sort of prediction of a sport performance. We believe that the answer to these last two questions is positive. To define the problem in broad terms, we must first reflect on the factors that influence the sports performance of an athlete or a team. In this context, the complexity in the modelling of sports appears at different levels: in individuals who practice sports, in teams, in competitions and tournaments; in the various aspects involved in sport: biomechanical aspects, metabolic aspects, environmental conditions, judges' evaluation, rankings that determine certain encounters, draws; the climate or weather conditions where the performance takes place, the physical, psychological and emotional state of the athlete and his companions. This does not preclude however to address the problem on a quantitative basis in order to increase the understanding of the phenomenon and possibly make verifiable predictions. In a first phase of study, it is essential to have accurate quantitative data on the performing protagonists to extract the relevant information and eliminate redundancies by capturing possible significant correlations (this, for example, is the task of statistics; the analysis of variance, the method of the main components, cluster analysis, linear and non-linear regression). Given these elements, it will be possible to choose the most important variables, to develop a model for the fundamental principles of mature sciences (mechanics, fluid dynamics, physiology, psychology, sociology), then estimate the parameters and test the experimental model in order to improve and/or refine it; in the final phase of the work, we can obtain verifiable quantitative predictions, possibly with a probabilistic estimate of the margin of error. In literature, there are several mathematical models to predict the *performance* of an athlete or the detection of one or more physiological parameters considered to be fundamental in the preparation of an athlete for an event. *The fitness-fatigue model* [14] is well known - a dynamic model of development

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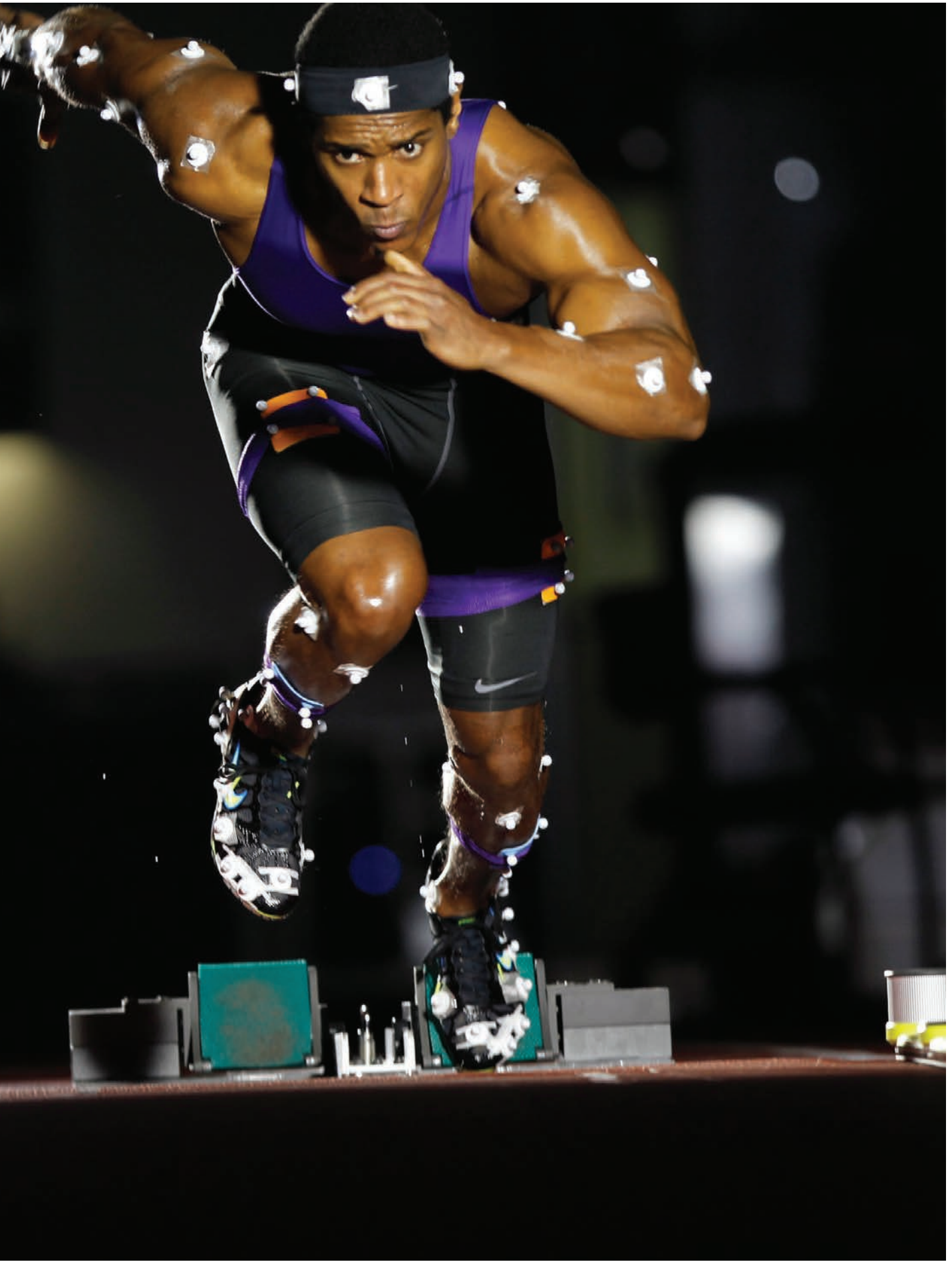

which is based on the idea that the response variable (performance or physiological parameter) depends on antagonistic variables responding positively and negatively to the athlete's training load (*fitness* and *fatigue*, respectively). From an initial p_{in} value and by modelling the fitness and fatigue parameters with appropriate differential equations in time, the model predicts that at time *t* (measure of time after which you want to estimate the effects of training) the variable response *p (t)* varies according to the deterministic law

p(t)= pin + k1 • fitness + k2 • fatigue

The parameters k_1, k_2 determine the influence of the *fitness* and *fatigue* variables on the value of the response variable, and are to be estimated with error minimisation procedures, training the model to well approximate existing time series. We wish to underline the fundamental concept that a predictive model must be able to replicate already known data and time series: in cases (always check carefully) that the acquisition of new data is conducted under conditions reasonably similar to those relating to the acquisition data of the time series, the model can then be used to provide its prediction on new data. It is clear that, from the mathematical point of view, such a model can be extended to include other variables, increasing the overall complexity of the system, and at the same time, improving its quality predictive in perspective. In this phase, the communication between who creates the model (the mathematician) and the expert (the sports trainer, the athlete, the coach) is fundamental in order to translate the mathematical language appropriately in all possible real dynamics that are to be included in the model. In the world of sports, it is important to work on other aspects besides the determination of the temporal evolution of an athlete's performance variable; in this case, mathematical modelling can help in identifying talent, in studying the variability of specific movements, in predicting (and minimising) injuries, and in decision-making during the sporting event. These aspects are generally predictable on the basis of existing time series to work with mathematical constructs such as ANN - Artificial Neural Networks [15]) and GAM - Generalised Additive Models [16]). The ANN work by mimicking the real behaviour of neurons: an input signal reaches the cell body (the soma) from other neurons through the dendrites, and if the input is above a certain threshold, it returns an output which reaches the other neurons through the output line neuron (axon). Mathematically, this process is represented by a *weighted* sum of the input signals, and, should this sum exceed a limit value (provided that is the activation of a neuron by an electrical pulse), then it returns an output that, depending on the complexity of the ANN built, can serve as the input signal to other neurons, or may return the value of the output variable required by the model. The training phase of the network is essential in the use of such models, in other words, the series of mathematical procedures that suitably adjust the weights, as in the case of the *fitness and fatigue* model, and reduce errors of prediction regarding the value of the final output on already existing time series. An equally important result of the network is to estimate, from an analysis of weights, the importance of the various input signals, determining which of them have greater significance. Applications of ANN in sports are documented in literature: in [17] the author has estimated what physical characteristics in female swimmers are strongly linked with performance (in this case, height, chest width, foot length). Studies on the likelihood of accidents are published in [18] with relevant results that link the likelihood of injury for an athlete to the intensity of the workload and the duration of the training phase. The GAM models work in a similar way to the network, in the sense that based on n input signals we obtain an expected value of the output by means of a functional relationship of links that involves other functions to be determined, so as to minimise predictive errors of a known time series. GAM models are more flexible than Generalized Linear Models (GLM, [16]) and allow a more precise adjustment to the data. They are often used to predict the performance of athletes during medium or long term tournaments. For example, in [20] GAM were used to analyse the average number of points per game and rate of victory for the NCAA American University Basketball League: using as input variables the interaction between players, their age and the change

in their performance statistics during the tournament, the authors concluded that it is possible to evaluate possible changes in the performances of the athletes during the games. A similar approach was used in [21] where the authors used GAM methods for predicting skills in scoring for the *English Premier League* players on the number of goal kicks, and the player's average number of goals per game in the previous season.

All the above mentioned models have in common the need for a database of data on which to adjust, or more properly train, the parameters or functions of the model so as to minimise the error on the known data. It is clear that future predictions will be as reliable as possible only if the training of the model is based on a large database and includes many cases.

CONCLUSIONS

It is evident that different sports disciplines require, in general, different mathematical models. However, it is our clear belief that in many cases such modelling is possible, and can be of some help in improving the performance of athletes. To understand a complex phenomenon in depth requires multidisciplinary skills, as building a model capable of providing reliable quantitative predictions means putting together different skills and many mathematical techniques (modelling, numerical analysis, statistics, etc.). At the same time, you must start with a thorough analysis of historical data to highlight statistical correlations useful for the construction of the model.

In conclusion, we can say that the study of complex systems provides a framework for the consideration of a highly articulate and transversal reality. Thanks to the complexity theory, we now know much more about many systems which are very different and seemingly far from a mathematical description and that until not long ago were considered out of the scope of survey of exact sciences. We believe that the complexity theory can allow a non-strictly phenomenological approach of scientific inquiry to rather general matters in sport.

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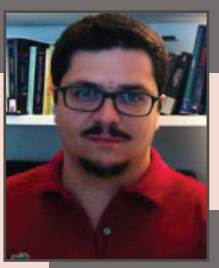

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The official journal of the European Weightlifting Federation

DESTINATION RIO. ACCLIMATISATION: GENERAL ASPECTS

From 5 to 21 August 2016, all eyes of the sporting world will be on Rio de Janeiro, which will host the XXXI Olympic Summer Games the first time for the South American continent. Rio was chosen as the host city on 2 October, 2009 during the 121st meeting of the IOC in Copenhagen, beating Madrid, Tokyo and Chicago after three rounds of voting.

BY ANTONIO GIANFELICI


Rio2016

Organising a number of important sporting events in cities and countries that are in time zones different to one's own, has in the past been the focus of attention of many experts regarding the issues that this condition could pose. Starting from the problems that arose around the Olympic Games in 1968 in Mexico City, or the work undertaken for the Olympic Games in Atlanta, Sydney and even more recently for those of Beijing 2008. In this regard, the Institute of Sports Sciences and Medicine of the Italian National Olympic Committee, produced a document that addressed the problems of acclimatisation, climatic conditions, health risks, even the problems of air pollution that the delegation of Italian athletes might have faced during their Olympics experience. With Rio having been appointed to host the next Olympic Games, the European National Olympic Committees once again face a challenge regarding any issues related to the trip. The overall focus includes many aspects, ranging from logistics to the minor aspects such as currency exchange, car rental and similar issues, but also engaging in and performing all their sports activities in the safest way possible. This short vademecum does not expect to solve all possible problems, nor to give information on all aspects of the trip, it is simply a memorandum of the physiological aspects related to acclimatisation.

WEATHER CONDITIONS

The 10,500 athletes expected at the Games in Rio will compete in a vast area around the bay of Rio where the weather may differ from one location to another. The various websites providing information about the climate and meteorological aspects show small differences. In order to predict the approximate climate in Rio in August 2016, we have used www.wunderground.com, analysing the climate over the last eight years, on days 5 to 21 August. A data analysis has provided us with general indications that pay particular attention to the possible and varied situations. There are days when the daily maximum temperature varies between 19 and 35°C, with an average of 26.4°C, while at night the temperature can drop to 12°C. One factor to be considered will be the possibility of high levels of humidity, which we know increase the perception of heat, as it makes evaporation of water contained in sweat more difficult. In comparison with the maximum temperatures and humidity recorded in the previous editions of the Olympic Games, we therefore expect an acceptable temperature (when we think of 32-33°C in Atlanta!), but with a considerably higher humidity rate. Since this is also the Southern Hemisphere, we must also take into account that it will still be the winter season and there is a chance of rain. The same analysis shows that four of the sixteen days of the competition could be marked by rain.

For those wishing to make an more in-depth study into the perception of heat as opposed to the different weather conditions and climates that they will encounter (temperature, humidity, solar radiation, wind speed), but also considering the anatomical structure of the athlete, the type of clothing to wear, exercise intensity required, there is a simple and useful application called RayMan, available for free on the Internet.

THE TIME ZONE

The time differences between Rio and Europe In August will vary between -8 to -4: we must also take into account the Summer Time. Although apparently the time difference may seem excessive for some European countries, the competition timetables will be taken into consideration, such as that already approved by the IAAF for athletics, which shows the insertion of many finals into the morning sessions, in order to boost visibility of the sport in all the different time zones of the world, but also the possibility to play games in the evening in Rio when it is night-time in Europe.

JET LAG

The time difference is one of the conditions that brings about what is commonly known as "jet lag" or circadian dysrhythmia. International scientific literature indicates that sleep is a fundamental condition for anybody, with a semeiological makeup and symptoms that

patients describe as a condition of non-physical well-being from lack of sleep due to an alteration of the so-called biological clock, synchronised with the Earth's solar day under physiological conditions; which implies a shift in the sleep-wake cycle (the ascending reticular formation of the central nervous system and other circadian rhythms are involved, such as the production of hormones, neurotransmitters and neuromodulators, primarily serotonin, dopamine and gamma-aminobutyric acid) in addition to enkephalins and endorphins. From the sports point of view, this may coincide with a loss of capacity performance: a survey carried out by the CONI Department of Psychology of the Institute of Sports Science and Medicine in 1997, involving high-level Italian athletes from various sports federations, showed that approximately 80% of the athletes suffered jetlag in the days following transoceanic flights. Most (65%) of them believed that their performance would not have been affected had the trip been made at an earlier date. However, 31% believed that their performance could have been adversely affected. Therefore, the task of the staff that will accompany the Olympic athletes in their adventure, will be to provide the best acclimatisation conditions, checking in advance the individual responses to the transoceanic experience.

ACCLIMATISATION CONTROL

The ensemble of physiological changes that characterise acclimatisation is obviously aimed at improving living conditions and the ability to perform; the entity of the process depends on numerous endogenous and exogenous factors. A good acclimatisation to intermediate situations is just a step towards acclimatisation to the final condition, which may be liable in some cases, but not exactly to the case of Rio. Some of the body's responses to the above-mentioned environmental changes are immediate or short-term, others come about in days, if not weeks or months; in any case, the response rate also depends on individual characteristics, in fact, the acclimatisation process should be customised. There is a huge variability in individual response and the acclimatisation process can be more or less rapid or complete in different individuals.

The acclimatisation process should be studied in its complexity and in its entirety, with respect to the involvement of the complex biological organism that is man. However, our inability to analyse performance from an holistic viewpoint, if not very briefly, which is the performance itself !, leads us to make a series of assessments that do not exclude one another, but rather offer the possibility to integrate as much data as possible for a better diagnosis of acclimatisation.

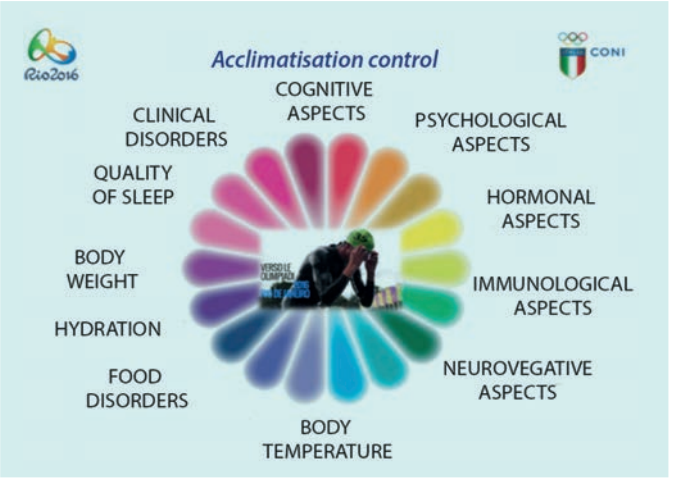


FIGURE NO. 1
THIS FIGURE SHOWS SOME OF THE ASSESSMENTS THAT CAN BE TAKEN INTO ACCOUNT WHEN EXAMINING ACCLIMATISATION.

Acclimatisation control

COGNITIVE ASPECTS
PSYCHOLOGICAL ASPECTS
HORMONAL ASPECTS
IMMUNOLOGICAL ASPECTS
NEUROVEGATIVE ASPECTS
BODY TEMPERATURE
FOOD DISORDERS
HYDRATION
BODY WEIGHT
QUALITY OF SLEEP
CLINICAL DISORDERS

▪ hormonal rhythm

Testosterone (T), DHEA-S (D) and cortisol (C) are considered good markers of training stress and of the balance between anabolic (Testosterone and DHEA) and catabolic (cortisol) processes, even when we know the circadian rhythm that characterises them. It is precisely for this reason that some authors have also proposed the use of the measurement of the daily production expressed as Area Under the Curve (AUC). In a study by Bernardi, carried out on saliva samples of Paralympics athletes before the Vancouver Olympics, they checked

the circadian rhythm of the hormones in athletes with physical disabilities and highlighted the daily hormonal response to different stimuli (training, race, physiological tests) compared to a day of rest: the study highlighted the normal daily fluctuation of C T but not of D, which also shows higher concentrations compared to normal range values present in literature, in all of the conditions studied. Of all the parameters measured (C, T and D at different times and days) and their subsequent processing (ratio of T/C and D/C concentration and AUC and AUC ratio), only morning C has differences between the various days, and can therefore be considered a "sign of stress."

▪ heart rate variability

Heart rate can be defined as the average number of heart beats per minute; this number, for example, 70 bpm, it is only an average value, because in reality, the time that elapses between one heartbeat and another, is not constant, but continuously changes. Heart Rate Variability is a method of statistical analysis of how and what are the changes in the time between one beat and the next. Statistical analysis of the data allows to obtain information on the condition of the autonomic sympathetic and parasympathetic nervous system. The ability of the organism to change its balance toward one or the other system is very important and is a fundamental mechanism that tends towards the dynamic equilibrium of the organism both from the physiological and psychological point of view. The HRV is measured in two phases: the first is the collection of the data or the recording of a sequence of beats using an electrocardiographic (ECG) device, with normal surface electrodes that are applied at the level of the heart: Nowadays some heart rate monitors are also capable of recording the HR beat for beat; the second phase is the analysis of the collected data using various types of software. One type of data analysis provides the Power Spectrum that contains information essential to estimate the balance between Sympathetic and Parasympathetic systems. Studies and research over the last 15 years have allowed us to distinguish three sub-frequency bands of the spectrum analysis:

1) VLF (Very Low Frequency) frequency range between 0.01 to 0.04 Hz. The VLF band is partially due to the activity of the Sympathetic Nervous System and to changes in temperature regulation. In a psychological context it is also influenced by worry and rumination;
2) LF (Low Frequency) frequencies between 12:04 and 00:15 Hz. The bandwidth of the LF is considered mainly due to the activity of the Sympathetic Nervous System, and the regulatory activity of the baroreceptors;
3) HF (high frequency) frequencies between 0.15 to 0.4 Hz. The HF band is considered an expression of the Parasympathetic Nervous System and the Vagal nerve.

The relationship between the Sympathetic and Parasympathetic is, on the other hand, measured by the ratio of LF/HF.
In addition to understanding the changes that occur in the autonomic nervous system in the course of exercise, the analysis of R-R variability has provided a non-invasive tool for investigating the effects of training on the autonomic control of heart rate in athletes under rest. The spectral analysis in the short term appears more correct from the methodological point of view, as well as easier to implement, as it evaluates the oscillations of the heart rhythm in stationary conditions of the signal, even if literature reports work carried out on 24 hour recordings.The possible use of the seriate analysis of the R-R variability as a diagnostic tool in respect of the so-called syndrome of overtraining and in all those conditions in which there is a need for an evaluation of the neurophysiological adaptations, conditions in which one of the main pathophysiological elements is precisely a persistent alteration of the sympathovagal balance. In our own experience before the Olympic Games in Beijing, characterised by European athletes as a "challenging" time zone, we used this tool, among others, highlighting and analysing changes in the sympathovagal system responses. This provided us with information about the adaptation timing of each individual athlete rather than generalising it for the group.

▪ control state of hydration

Bioelectrical Impedance Analysis (BIA) is a non-invasive method that allows to analyse body composition in seconds thanks to the detection of the impedance, namely the "resistance" opposed by the body opposite to the passage of an alternating low frequency electric current. The current is conveyed by gel electrodes placed on the hand and

foot. A sinusoidal electric current, applied to living organisms, highlights two biological structures of different physical behaviour:
- Intra/extra-cellular fluids (ICW-ECW) that act as resistive conductors;
- Cell membranes that behave as reactive conductors.

The lean tissues are highly conductive due to their high content of water and electrolytes and oppose limited resistance to alternating electric current. The cell membrane, characterised by a non-conductive phospholipid bilayer, placed between two layers of conductive protein molecules, makes the cells reactive elements that behave as capacitors when an electric current is applied to them. Testing on humans has shown the insignificance of parameter reactance and especially its uncertain biological and clinical significance (Consensus Conference on BIA, NIH 1994). Impedance and phase angle are the only parameters that define the behaviour of the human body to the passage of the current, and this takes place with excellent reproducibility in various pathophysiological conditions. Impedance and phase angle thus represent universal parameters applicable to humans regardless of the topological configuration of the subject under consideration. In practice, BIA allows you to analyse changes in body hydration that are immediately perceived through the drastic reduction or the high increase of the impedance. Therefore, as with the other methods described above, measuring the state of hydration is helpful in controls at short time intervals, in order to monitor if weight loss is attributable to the depletion of water or fat mass.

▪ Clinical monitoring of sleep

Humans have a sort of built-in biological clock that affects some physiological processes and that conditions waking and sleeping hours. The operation of this clock corresponds to the circadian cycle (from the Latin diem = circa one day), that through the action of chemical and neural messengers, regulates the organic processes that occur every day in our body; digestion, urination, evacuation, growth and cell turnover are but a few examples. A regular sleep-wake cycle is the most restful, however, it appears that personal psychological characteristics somehow determine the need for sleep.
Monitoring the quality and quantity of sleep with a simple self-compiled questionnaire can be a simple and effective method to monitor adaptations.

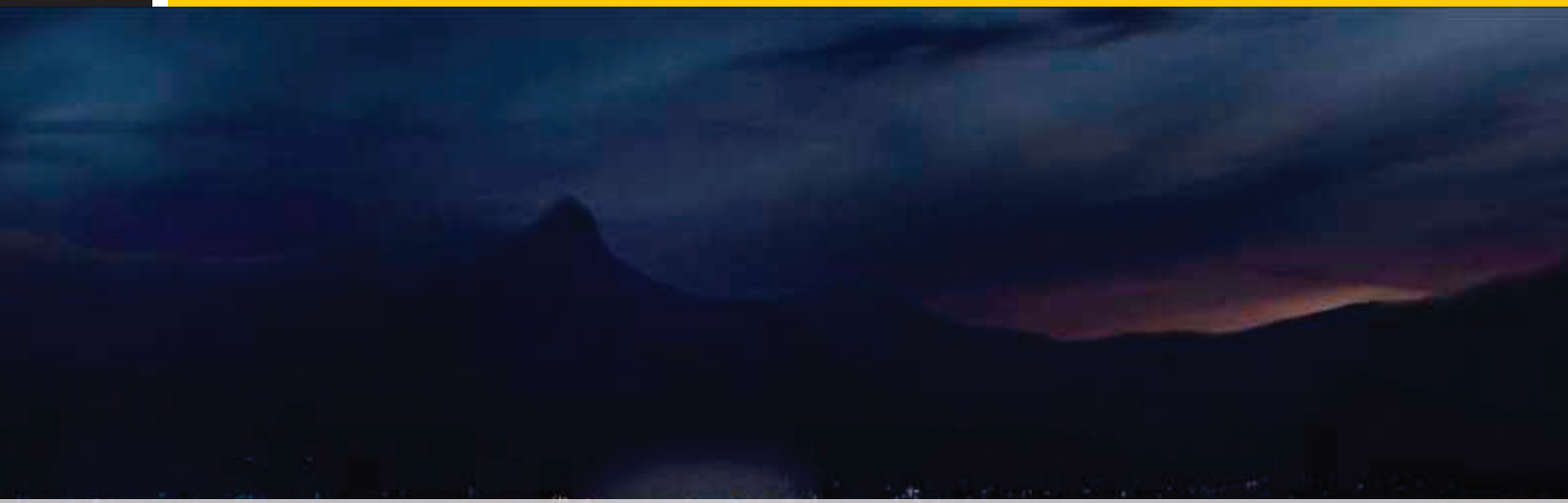
▪ psychometric tests

There are several psychometric instruments for the evaluation of adaptive responses to stress for assessing the state of mood. POMS (profile of mood state) is a method to identify and quantify specific affective states. The analysis of 58 questions - there is an alternative version with fewer questions- leads to the definition of six factors: Tension, Depression, Anger, Vigour, Fatigue, Confusion. The trend of several factors, analysed through a numerical value of synthesis (Total Mood Disturbance), allows to precisely frame the those mood adaptations in individuals to different stimuli.

A DECALOGUE FOR OPTIMUM ACCLIMATISATION

Science must help people to live better and sports science must help athletes to train better but also to live better. Therefore, all the considerations that have been made so far must be translated into a message that can be applied. To conclude this brief review, here is a Decalogue of rules and suggestions dictated by scientific considerations on acclimatisation, in part to be interpreted with common sense, in part to be carefully monitored.

Courtesy of EWF



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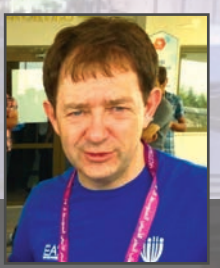

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Editorial guidelines

EDITORIAL GUIDELINES FOR AUTHORS OF ORIGINAL RESEARCH WORK TO BE PUBLISHED 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.nsca-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 .

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

1. A portion of the texts published by *SM*, as a specific editorial choice, are versions in Italian of highly accredited work already published elsewhere, carefully selected among the many papers available in literature. It is also an editorial policy to include research from young up and coming Authors or those in training. Articles may be submitted by e-mail, in the form of files in Microsoft Word format (.doc), to *dir@calzetti-mariucci.it*, following the instructions below. Authors are required to attach the declaration of assignment of copyright for paper and digital publication, which may be downloaded from www.calzetti-mariucci.it.

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3. Articles will be evaluated for publication, provided they have been submitted exclusively to *SM* and, therefore, have not already been published and will not be published elsewhere in whole or in part. Manuscripts containing data that have already been published on the Internet, available for public inspection, cannot - as a rule - be considered for publication.

4. As required by law, articles will be printed in compliance with the original version and with the name of the Author. Any matters not expressly provided for in these editorial notes and by the act of transfer of copyright attached to the article, shall be subject to the laws and customs regulations in force. All disputes arising between the parties regarding the interpretation and application of these editorial notes and/or the act of transfer of copyright, shall be resolved exclusively by the competent Court of Perugia.

5. The material submitted for publication must be accompanied by a brief resume of the Author or Authors.

6. *SM* adopts standards for the protection of living beings, with regard to testing on animals and humans. In this regard, the Authors of the work submitted for publication must have received appropriate approval from their institutional control bodies or if necessary, must demonstrate to have obtained the appropriate consent under the applicable laws. All submissions must include a statement to that effect, in the Methods section of the document presented. Failure to do so will result in the paper not being considered for publication.

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 ± 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 α 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:

Adobe Photoshop (.psd)

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If a digital camera is used to take pictures for printing, maximum resolution with less compression must be set. As digital camera manufacturers use terms and different file formats for capturing high-resolution images, please refer to the manual of the actual camera used for more information.

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

SM does not charge the Authors with any fees for presentation or per page. It is precisely for this reason that it is assumed that once the manuscript has been accepted for publication and sent to the printers, it is in its final form.

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. **ml • min-1 • 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 (° C); energy, heat, work: joule (J) or kilojoules (kJ); power: watt (W); time: Newton per meter (N • 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 N = 0.102 kg (force);
- 1J = 1 N • m = 0.000239 kcal = 0.102 kg • m;
- 1 kj = 1000 N • m = 0.239 kcal = 102 kg • m;
- 1 W = 1 J • s-1 = 6.118 kg • m • 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).

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Spanish resumenes

MÁS ALLÁ DEL ENTRENAMIENTO COMPLEJIDAD Y DEPORTE
Fabio Bagarello, Francesco Gargano, Francesco Oliveri, Salvatore Spagnolo
SM (ing.), n.° 3, año II, enero-abril de 2016, págs.
Se trata de una interesante presentación del mundo de la complejidad y de su teoría, aplicada al sistema del deporte. Los autores describen, a grandes rasgos, la teoría de la complejidad en cuestión y sus fundamentos, y reflexionan sobre la posibilidad y el significado de aplicar modelos matemáticos al deporte. Los autores se detienen en algunas conclusiones interesantes sobre la posibilidad de comprender mucho mejor al deportista que en el pasado, mediante la complejidad.

¿UN ENFOQUE DISTINTO? PENSAR DE MANERA NO CONVENCIONAL
Remco Eenink
SM (ing.), n.° 3, año II, enero-abril de 2016, págs.
Al autor se centra en la necesidad de comprender completamente las modalidades del crecimiento concreto del rendimiento en las especialidades del levantamiento de pesas y hace consideraciones interesantes sobre el desarrollo de la técnica y sobre el entrenamiento para aumentar la fuerza muscular que ha de caracterizar el crecimiento del deportista. Es especialmente original la reflexión sobre la fórmula del talento.

DESTINO RÍO. ACLIMATACIÓN: ASPECTOS GENERALEs
Antonio Gianfelici
SM (ing.), n.° 3, año II, enero-abril de 2016, págs.
El autor, con vistas a analizar atentamente los Juegos de Río de 2016, ha compilado numerosas noticias y reflexiones interesantes sobre las condiciones meteorológicas de las sedes de los Juegos; la diferencia de huso horario; el jet lag; y el seguimiento de la aclimatación a través del ritmo hormonal, la variabilidad de la frecuencia cardiaca, el control del estado de hidratación, el seguimiento clínico del sueño y las pruebas psicométricas. Resulta de gran utilidad el decálogo final para conseguir la mejor aclimatación.

LA ENFERMEDAD DE OSGGOD-SCHLATTER EN LA PRÁCTICA DE LA HALTEROFILIA
Antonio Urso, Nicola Voglino
SM (ing.), n.° 3, año II, enero-abril de 2016, págs.
Los autores exponen las características de un trastorno inflamatorio que interesa la inserción del tendón rotuliano en la tibia y que aqueja a los jóvenes que practican especialidades deportivas que conllevan la extensión bajo tensión del cuádriceps. Se debaten las causas de la enfermedad, su patogenia y la sintomatología asociada, así como el posible tratamiento y el pronóstico, que casi siempre es benigno.

AUMENTAR AL MÁXIMO EL RENDIMIENTO DEPORTIVO: OBSERVACIONES SOBRE LA PERIODIZACIÓN Y SOBRE LA VARIACIÓN DE LA CARGA
Jay R. Hoffman
SM (ing.), n.° 3, año II, enero-abril de 2016, págs.

Si bien se acepta que las estrategias de periodización son cruciales para aumentar al máximo el rendimiento deportivo, el debate sobre qué modelo de periodización es el más idóneo sigue abierto. Ello se verá influido sin duda por las necesidades de entrenamiento del deportista, el grado de experiencia del mismo, la duración del programa de entrenamiento y la frecuencia de entrenamiento utilizada. Parece que la incorporación del entrenamiento olímpico y balístico para los deportistas de fuerza y potencia experimentados y entrenados para aumentar su resistencia influye de forma significativa en estas dos competencias. La inclusión de estos ejercicios durante ciclos específicos de entrenamiento puede aumentar de forma notable la adaptación al entrenamiento.

MÁS ALLÁ DEL ENTRENAMIENTO (SEGUNDA PARTE). CUERPO. MOVIMIENTO. Y CUERPO EN MOVIMIENTO. O SEA. INSTRUMENTO. MEDIO. Y FIN.
Alberto Andorlini
SM (ing.), n.° 3, año II, enero-abril de 2016, págs.

"Cuerpo. Movimiento. Y cuerpo en movimiento. O sea. Instrumento. Medio. Y Fin" es la segunda aportación multidisciplinaria de la serie. Un primer paso, para definir una nueva metodología de intervención en el ámbito del entrenamiento del movimiento. Nuestra disertación comenzó en el número anterior de la revista científica EWF. En el presente número, se aborda un eje de referencia (del cuerpo al movimiento hasta el cuerpo en movimiento) que representa el compás con el que orientar las consideraciones y estimular análisis más detallados (capítulo 3); se aborda un gramática elemental encaminada a proporcionar los instrumentos necesarios para descodificar cualquier composición motora (capítulo 4); y por último, se define un modelo metodológico y operativo que posibilite el "rendimiento" (capítulo 5). El "rendimiento" (ordinario y extraordinario) que no puede limitarse a un único instante, una única sesión de entrenamiento, un único momento o una única ejecución, sino que ha de extenderse a todos los movimientos y... a todos los elementos que estos tienen en común.

A MEDIDA DE HOMBRE
Menotti Calvani
SM (ing.), n.° 3, año II, enero-abril de 2016, págs.
El autor introduce el concepto de constitución y, con una digresión histórica, trata de vincular el concepto a la necesidad de definir también la biodiversidad humana en el ámbito del deporte. Resulta muy significativa y original la referencia a la madre como la primera entrenadora de nuestra vida. Los conceptos de composición corporal y sarcopenia también se presentan como trastornos que han de afrontarse en las fases más avanzadas de la vida.

LOS RECIENTES AVANCES REALIZADOS CON RESPECTO A LOS MÉTODOS DE DIAGNÓSTICO POR LA IMAGEN DE LA EVALUACIÓN BIOMÉTRICA POSTURAL: SPINALMETER, CERVICALMETER Y LA PLATAFORMA BAROPODOMÉTRICA
Stefano Sabatini
SM (ing.), n° 3, año II, enero-abril de 2016, págs.
El autor presenta tres dispositivos médicos, gestionados por un único programa informático, para la evaluación biométrica postural, es decir, para la evaluación de los desequilibrios musculares de la columna vertebral (paramorfismos y dimorfismos estructurales), para la evaluación específica del raquis cervical y para el estudio del apoyo plantar.

DOPAJE Y DOPAJE GENÉTICO: UN PLANTEAMIENTO ÉTICO
Sofia A. Matsagkou
SM (ing.), n° 3, año II, enero-abril de 2016, págs.
¿En qué momento sería oportuno plantear la cuestión ética? ¿Por qué motivo debería influir este criterio en nuestras decisiones y de qué forma pueden considerarse estas el resultado de una reflexión ética? Las preocupaciones que se exponen a continuación surgen de las cuestiones relacionadas con la interferencia de tales prácticas con la salud de los deportistas y con la limitación de su autonomía y libertad, la falta de equidad, así como el hecho que el dopaje farmacológico se aleja del objetivo de la práctica deportiva, de los ideales del deporte y de los principios olímpicos. Además, la cuestión del dopaje genético nos concierne porque llama la atención sobre problemas de gran envergadura, como la alteración permanente de la especie humana, por ejemplo. Gracias a nuestro breve recorrido en el ámbito de la ética, hemos creado una "República de los ideales deportivos" con la que se trata de demostrar la importancia de adoptar un comportamiento correcto y los resultados que con ello se obtienen. Es comprensible que estas cuestiones éticas susciten interés; la utilización del dopaje farmacológico y genético no se considera ética porque con ello se violan o se anulan numerosos principios (la eficacia, la colectividad, el deber moral hacia sí mismo y el derecho a la salud) y valores intrínsecos (la naturaleza y el valor y la dignidad de las personas). Todos estos principios y valores deberían aportar un significado concreto a la propia esencia del deporte y del deporte de élite; asimismo, deberían formar parte integrante del proceso formativo que se ofrece a los equipos y a los deportistas individuales.

Russian

N° 3 / January-April 2016

ПОНЯТИЕ «СЛОЖНОСТИ» И СПОРТ

Fabio Bagarello, Francesco Gargano, Francesco Oliveri, Salvatore Spagnolo

Речь идёт об интересном представлении о мире сложности и о теории сложности применительно к системе спорта. Авторы описывают, в общих чертах, теорию сложности и её основы и размышляют о возможности применения математических моделей в спорте. Авторы подробно останавливаются на некоторых интересных идеях о возможности понять, через понятие сложности, гораздо глубже по сравнению с прошлым, что такое человек-спортсмен.

ИНОЙ ПОДХОД? ДУМАТЬ НЕ БАНАЛЬНЫМ ОБРАЗОМ

Remco Eenink

Автор акцентирует внимание на необходимости понять в полной мере как достигуть реального роста результатов в различных дисциплинах тяжёлой атлетики, делая интересные замечания по поводу развития техники и тренировки направленные на повышение мышечной силы характеризующие рост мастерства спортсмена. В частности очень оригинальным является размышление о «формуле» таланта.

НАПРАВЛЕНИЕ РИО. АККЛИМАТИЗАЦИЯ: ОБЩИЕ АСПЕКТЫ

Antonio Gianfelici

Учитывая необходимость подготоки к прближающейся Олимпиде 2016 года в Рио, Автор собрал много интересных новостей и размышлений о метеорологических условиях тех мест где будут проводиться соревнования, о разнице часовых поясов, о феномене Jet Lag (расстройстве суточного биоритма в связи с дальним перелетом), о контроле акклиматизации через гормональный ритм, о переменчивости частоты сердечных сокращений, о мониторинге состояния гидратации, о клиническом мониторинге сна, о психометрических тестах. В заключнии представлен очень полезный набор советов для улучшения реализации акклиматизации.

БОЛЕЗНЬ ОСГГУТА-ШЛЯТТЕРА В ПРАКТИКЕ ТЯЖЁЛОЙ АТЛЕТИКИ

Antonio Urso, Nicola Voglino

Авторы описывают характеристики воспалительного патологического состояния, которое затрагивает сухожилие четырехглавой мышцы бедра прикрепляющееся к бугристости большеберцовой кости. Этой болезни подвержены лица молодого возраста, занимающиеся видами спорта в которых нагрузка провоцирует расширение четырёхглавой мышцы бедра. Авторы обсуждают причины заболевания, его патогенез, симптомы, и возможные методы лечения поскольку исход лечения и прогноз как правило почти что всегдаимеют полоительный исход.

ДОСТИЖЕНИЕ МАКИМАЛЬНЫХ СПОРТИВНЫХ РЕЗУЛЬТАТОВ (PERFORMANCE): РАЗМЫШЛЕНИЯ О ПЕРИОДИЗАЦИИ И О ВАРЬИРОВАНИИ НАГРУЗКИ

Jay R. Hoffman

Хотя и признано что стратегии периодизации играет решающую роль для достижения максимальных спортивных результатов, существует ещё много дискуссий о том какая модель периодизации является наиболее приемлемой. По всей вероятности на это влияют следующие факторы: требования подготовки конкретных спортсменов, уровень подготовки спортсменов, продолжительность тренировочной программы, частота тренировочных занятий. Вероятно что использование в тренировке олимпийских и баллистических упражнений оказывает значительное влияние на performance (уровень результатов) силы и мощности у спортсменов с высоким уронем подготовки силы занимающимися видами спорта требующими проявления силы и мощности. Использование этих упранений в течении определённых циклов тренировочного процесса может привести к значительному улучшению тренировочной адаптации.

НЕ ТОЛЬКО ТРЕНИРОВКА (ВТОРАЯ ЧАСТЬ) – ТЕЛО. ДВИЖЕНИЕ. ТЕЛО В ДВИЖЕНИИ. А ИМЕННО: ИНСТУМЕНТ, СРЕДСТВО И ЦЕЛЬ

Alberto Andorlini

«Тело. Движение. Тело в движении. А именно: инстумент, средство и цель» это вторая статья из серии «политематических публикаций». Первый и очень осторожный шаг в этом смысле заключяется в определении новой методологии Тренировки Движения. Наша научная работа началась со статьи опубликованной в предыдущем выпуске научного журнала «EWF Scientific Magazine». В настоящем номере рассматривается основной стержень проблемы: начиная с тела – потом движение – и наконец тело в движении, стержень который представляет собой определённый «компас» с помощью которого можно ориентировать размышления и углублять исследования (третья статья). В дальнейшем будет рассматриваться так называемя «элементарная грамматика» целью которой является разработка инструментов для декодификации любой двигательной композиции (четвёртая статья); и наконец подойдём к определению методологической и оперативной модели, которая приводит в действие «performance» (пятая статья). Эта «performance» (ординарная и страординарная), которая не может быть сведена только к одному моменту или только к одному тренировочному занятию, или к только к одному выполнению движения или упражнения, должна быть распространена на все движения и… на все элементы общие для любого движения.

В ЧЕЛОВЕЧЕСКОМ МАСШТАБЕ

Menotti Calvani

Автор вводит новое понятие «конституции» и реализует интересный исторический экскурс, говоря о необходимости определить понятие «биоразнообразия человека в области спорта». Очень интересным и оригинальным является обращение с матери как к первому тренеру жизни. Авторы считают очень важными понятия «телосложение» и «саркопения» особенно когда речь о людях значительного возраста.

СОВРЕМЕННЫЕ ДОСТИЖЕНИЯ В ОБЛАСТИ ОБРАБОТКИ ИЗОБРАЖЕНИЙ ОЦЕНИВАЮЩИХ БИОМЕТРИЧЕСКОЕ ПОЛОЖЕНИЕ ТЕЛА: SPINALMETER, CERVICALMETER И БАРОПОДОМЕТРИЧЕСКАЯ ПЛАТФОРМА

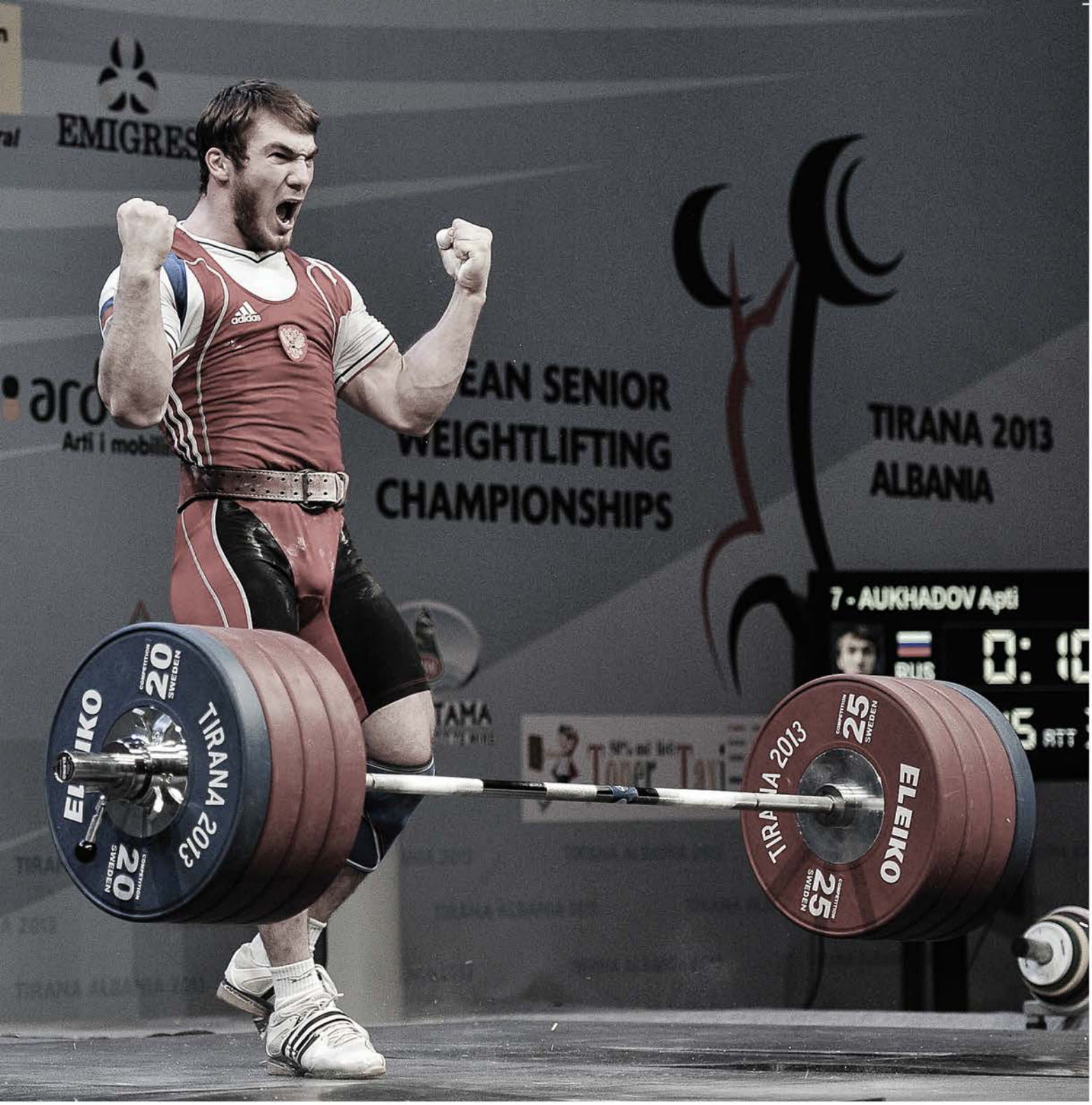
Stefano Sabatini

Автор представляет три медицинские прибора управляемые единым программным обеспечением. Представленные приборы используются для биометрической оценки положения тела, а именно для оценки мышечной несбалансированности позвоночного столба (структурные параморфизмы и дисморфизмы), для специфической оценки шейного отдела позвоночника, для изучения подошвенной опоры.

ДОПИНГ И ГЕНЕТИЧЕСКИЙ ДОПИНГ: ЭТИЧЕСКИЙ ПОДХОД

Sofia A. Matsagkou

В какой момент было бы целесообразно поднять этическую проблему? Почему этот критерий должен влиять на наши решения и каким образом наши решения могут рассматриваться как результат этической оценки? Озабоченности автора изложеннные в статье основаны на ситуациях связанных с влиянием подобной деятельности на здоровье спортсменов и на ограничение их независимости и свободы, на отсутствие справедливости, и связаны с тем что фармакологический допинг направлен против самой цели спортивной практики, спортивных идеалов и олимпийских принципов. Проблема генетического допинга нас касается ещё и потому что привлекает внимание к вопросам имеющим важные последствия как например постоянное изменение человеческого рода и т. д.. Благодаря краткому экскурсу в область этики мы создали так называемую «Республику спортивных идеалов» с помощью которой стараемся показать важность и результаты правильного поведения. По понятным причинам подобные этические проблемы должны вызывать интерес; использование фармакологического и генетического допинга не считается этичным потому что связано с нарушением и непризнанием многочисленных принципов (эффективность, коллегиальность, моральный долг по отношению к себе, право на здоровье) и истинных ценностей (Природа, ценность и достоинство человека). Все эти принципы и ценности должны придавать конкретное значение самой сущности спорта и спорта элитного уровня; кроме того должны быть неотемлемой частью тренировочного процесса команд и отдельных спортсменов.



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