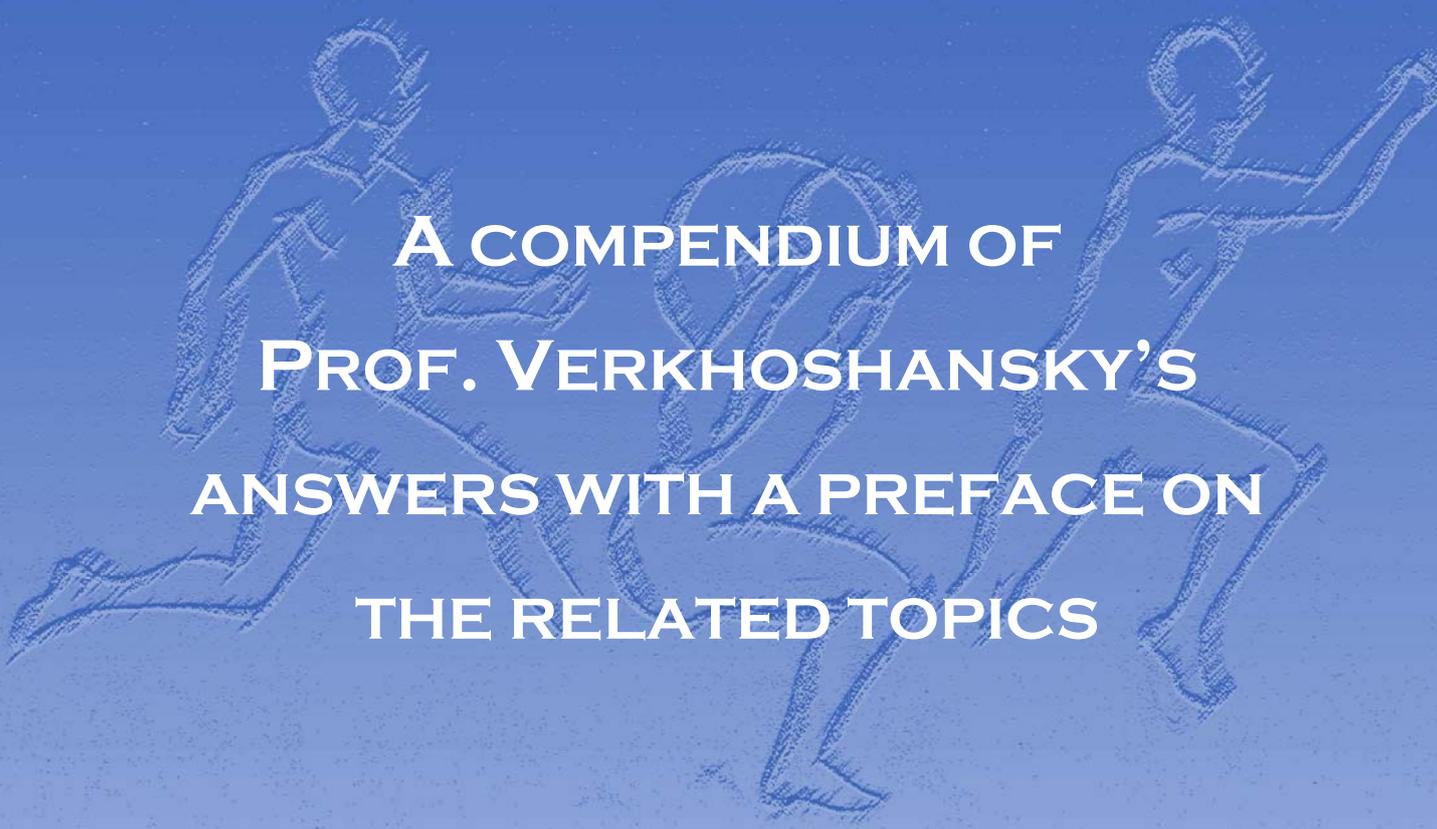




*SPORT STRENGTH TRAINING METHODOLOGY©*



# **VERKHOSHANSKY FORUM**

The background of the lower half of the cover is a dark blue gradient. Overlaid on this are several white chalkboard-style sketches of athletes in various dynamic poses: a runner, a person in a starting crouch, a person in a lunging position, and a person in a jumping or landing pose.

**A COMPENDIUM OF  
PROF. VERKHOSHANSKY'S  
ANSWERS WITH A PREFACE ON  
THE RELATED TOPICS**



This book has been editorially elaborated on the basis of the answers of Prof. Yuri Verkhoshansky posted in the Forum of his website.

The preface has been taken from the book “Special Strength Training: Manual for Coaches” which is due to be published in 2011.

*Verkhoshansky Forum*

*A compendium of Prof. Verkhoshansky's answers with a preface on the related topics*

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Edited by Daniel Raimondi and Natalia Verkhoshansky

Drawing on the cover of Giulia Marino

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Enquiries should be addressed to the following e-mail address: [books@verkhoshansky.com](mailto:books@verkhoshansky.com)

## PREFACE

During the late 1950's Yuri Verkoshansky was an unknown young coach and great admirer of Vladimir Dyachkov. Dr. Dyachkov authored the first scientifically based training principles for the jumping events. In addition, he is also credited as the first to use weight training exercises in the preparation of high jumpers<sup>1</sup>.



Figure 1 - Photo on the left, the young high jumper V. Djachkov. Photo on the right, Djachkov with his most prolifically decorated athlete, high jumper Valery Brumel. Brumel won the silver medal in the 1960 Olympic Games and the gold medal at the Olympic Games of 1964. Brumel broke the world record six times, raising the record from 2.23m (7'4") to 2.28m (7'6").

Dyachkov did not regularly publish his training methods after he began his tenure as the Soviet national coach. In fact, the use of the special strength training in speed-strength sports events were highlighted for the first time in 1961 by Verkoshansky. In that year he published the unexpected results of the new training concept he had discovered accidentally, in the paper "The barbell in the training of track and field jumpers"<sup>2</sup>.

At the end of the 1950s, Yuri Verkoshansky was training a small group of Track & Field jumpers made up of students from the Aeronautical Engineering Institute. At that time, the institute did not have an indoor athletic facility for training during the harsh winters. Verkoshansky was relegated to training his pupils in the cramped space under the Institutes's staircase and in its meager corridors. By doing this, the training would not be interrupted by the weather conditions. It was here that the accidental discovery of an old barbell led to Verkoshansky's first use of exercises with weights.



"Because of the lack of space, the athletes were divided into two groups. While one group did barbell exercises, the other did jumping exercises in the corridor. The most frequently used jumping exercise

<sup>1</sup> Vladimir M. Dyachkov (1904–1981, Doctor Habilitatus was an athlete, coach and scientist. In the 1930s, he won the Soviet high jump and pole vault championships a total of 11 times. He later served as the Soviet national team head coach for the Olympic Games in 1960, 1964 and 1968. Dyachkov also was the personal coach to Olympic high jump champions, Valeriy Brumel and Robert Shavlakadze. He also served as the coach for Olympic medallists Taisia Chenchik and Antonina Okorokova in addition to European champion Valentin Gavrilov.

<sup>2</sup> Y. Verkoshansky, "The barbell in the training of track & field jumpers" in Track&Field Review, n.6, 1961

consisted of trying to touch the ceiling with a vertical jump, executed after a short run-up and a double leg take-off. Soon it was noticed that, by using this exercise, the athletes – who at first were only able to brush against the ceiling with their fingertips – began touching the ceiling with the palm of their hand. We were euphoric as if we were gold fossickers who had struck it lucky. We began ‘elaborating’ this new knowledge with great enthusiasm, trying to improve the methodological use of barbell exercises. Improvement in this work was given a great stimulus by V. Djachkov’s advice”<sup>3</sup>.

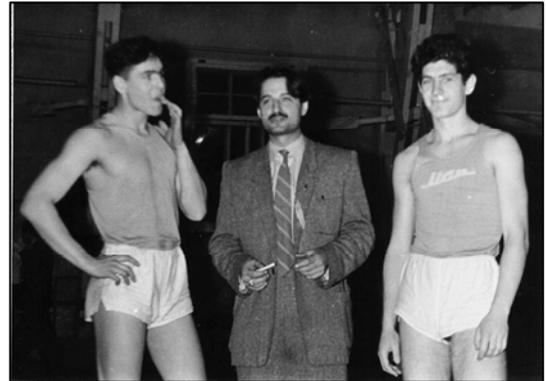


Figure 2 - Y.Verkhoshansky with his high jumpers Gerard Sorokin and Arcadiy Slobodskoy.

At the beginning, the athletes carried out only traditional weightlifting exercises. As the training progressed, more specific exercises were developed. These exercises were based on Verkhoshansky's analysis of the biomechanics of Track & Field's jumping events.

Verkhoshansky was conducting research during this time on the biodynamic structure of the triple jump technique. He discovered that the pressure during the last contact phase reached upwards of 300kg. This discovery led him to start the search for an exercise that reproduced the same conditions. He began his inquest by having the athletes perform half squats instead of full squats because the abbreviated range of movement allowed for an increase in the barbell weight. Unfortunately, this exercise immediately caused lower back pain in his lanky jumpers. His second attempt had the athletes perform a variation of the leg press. This exercise had the barbell placed on the feet and pressed vertically while two assistants prevented the barbell from falling. The athletes found they were unable to maintain control of the heavy barbell, and the exercise was deemed to dangerous to continue.

Verkhoshansky returned to reflect on the incredible strength effort of the triple jump and how he could replicate it in training. He contemplated that it would be possible to obtain such a strength effort by using the kinetic energy of the falling human body. To find a practical way to actualize this, he took his idea to the modest space available to him at the institute.

It was in this setting that the most revolutionary training exercise of the 20th century was created, the depth jump. Sometime later, this new discovery was adapted further to use falling weight's kinetic energy to increase the strength effort in upper body explosive movements. Verkhoshansky named his discovery the “The Shock Method.” Fred Wilt<sup>4</sup> would later coin the more

<sup>3</sup> Excerpt taken from the paper ‘The barbell in the training of track & field jumpers’.

<sup>4</sup> Fred Wilt (1920–1994) was a distance runner in the U.S. Wilt was a member of the 1948 and 1952 Olympic teams, and famous for his legendary indoor mile encounters at that time with Wisconsin's Don Gehrman. After retiring from the FBI, Wilt coached the women's running teams at Purdue University. He edited the publication Track Technique and advised various athletes. His star pupil was 1964 Olympian Buddy Edelen, who held the world marathon

cosmopolitan term “plyometrics” now used in the West. During the 1960's Wilt was a friend and colleague with whom Verkhoshansky often corresponded.

Though now seen as groundbreaking, in 1961 the paper ‘The barbell in the training of Track & Field jumpers’ was sceptically received by coaches. At the time, barbell exercises had never been used before in the training of track and field athletes. Training with weights had always been associated with increasing muscle mass and were thought to have a negative influence on speed. The thinking of the time was that ‘a runner must have the muscles of a deer, not a buffalo’. Notwithstanding such scepticism, some coaches were curious enough to attempt replicating what Verkhoshansky had described in his paper. They found that it was possible to obtain ‘the muscles of a deer’ by correctly practicing the barbell exercises. In addition, the exercises improved not only the length and height of the jumps, but also the running speed.



Figure 3 - Fred Wilt (1920–1994) the famous distance runner and author of many publications.

After the publication of Verkhoshansky's paper in 1961, barbell exercises became an essential part of the physical preparation of Track & Field jumpers and sprinters. Coaches became so accustomed to weight exercises that the depth jump was regarded as child’s play. It wouldn't be till the 1970's that the exercise came to be considered the most powerful training means for improving explosive strength. Soviet javelin thrower Jānis Lūsis<sup>5</sup>, used the depth jump during his preparation for the 1972 Olympics in Munich. Lūsis was determined to reclaim gold after winning it at the 1968 games with an Olympic record of 90.10m. Lūsis obtained a tremendous increase in explosive strength from his training. The increase was so great that the javelin technique he used in competition became inadequate to his new level of physical preparedness. He did not have enough time to adjust his technique before the Olympics, and consequently claimed only silver in Munich. His performance though was nothing short of spectacular. The competition was the closest javelin in history, with Lūsis losing by only 2cm. Lūsis had throws of 88.88m, 89.54m, and 90.46m. These throws marked 3 of the 4 longest throws of his Olympic career. In addition, his 90.46 surpassed the



Jānis Lūsis, Latvian athlete who won three Olympic medals: bronze in 1964, gold in 1968 and silver in 1972.

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record of 2:14:28. In the 1960s and 1970s, Fred Wilt became a famous writer and advocate of running. His book, “How They Train”, was a long-time best seller. His most popular book "Run, Run, Run..." is an incredible collection of articles on science, history and methods of running, reflecting his passion and desire to bring real knowledge to people.

<sup>5</sup> Jānis Lūsis is a Latvian (and Soviet) athlete who competed in javelin throw in four Summer Olympics for the USSR team, winning bronze in 1964 Olympics, gold in 1968 Olympics and silver in 1972 Olympics.

Olympic record, bested only by the winning throw of his competitor.

1962 marked the year that Djachkov finally published a paper in which he presented his “conjugated method” of using barbell exercises in training. Djachkov's training program consisted of using weight exercises in order to improve the technical skill of high jumpers. He used exercises with weights to increase the force efforts in the accentuated phases of the specific movements. Verkhoshansky sought to explore Djachkov's idea thoroughly and formulated the criteria for selecting these weight exercises. In 1963, Verkhoshansky published the ‘Principle of the dynamic correspondence between weight exercises and the biodynamic structure of the competition exercise’.

It is important to note that Verkhoshansky's and Djachkov's application of their principles were different with regard to their implementation. Though both respected colleagues, Djachkhov and Verkhoshansky had different approaches with regard to the application of the means in which their training was prescribed. They conducted their training in different environments altogether. This was due to their different positions in the coach's hierarchy, Djachkhov was head coach of Soviet national team, and Verkhoshansky was only the coach of a Moscow student's team. This hierarchical difference meant that Djachkhov could have at his disposal the resources to conduct his training sessions throughout the year. Verkhoshansky on the other hand, had limited resources and he did not have access to an indoor facility in the winter time. Djachkhov had the opportunity to train his athletes on an indoor high jump surface all year. This allowed them to perform specialized exercises that focused on improving the motor structure of high jumping. Therefore, weight exercises were used as a part of the athlete's technical preparation. In direct contrast, during the winter months Verkhoshansky had to spend entire training sessions concentrating only on weight training.

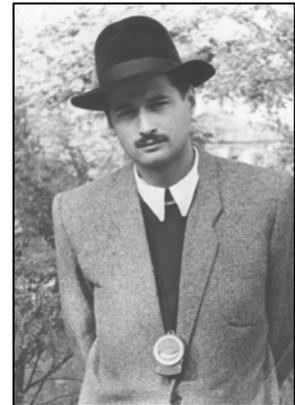
The Verkhoshansky's method of using barbell and jumping exercises in the same training session was more suitable to the goals of specific physical preparation: the prescribed training was directed towards increasing the ability of the athlete to produce a maximal strength effort in minimal time. Besides Verkhoshansky observed that the cumulative training effects of the barbell and jump exercises could be obtained when they are used in both the same training session, and the subsequent training sessions.

Verkhoshansky also noted that the cumulative training effects of these exercises, did not represent the sum of their training effect because the effects of previous training means change the training flow of subsequent means. The influence of subsequent means depend on their temporal sequences, and rest periods between them. Finally, he ascertained that the training influence of every training exercise decreases in the future training sessions if it is used over a long period of time.

These observations were the starting point of the Verkhoshansky's principle “**Integration of Training Means into a System**”. This principle stated that to assure an increase in a parameter of an athlete's physical preparedness, the cumulative effect of exercises with different training emphasis must be applied in harmony with specific exercises that adhere to the principle of dy-

namic correspondence. In addition, they must be correctly selected, integrated into a training plan, and used in one set sequence. Research on the application of this principle led to the development of the new SST Methodology. This is based on three new concepts: Conjugate-sequence system, Long-lasting Delayed training effect, and Block Training System.

Before the discussion of how these concepts were developed, it is necessary to look at how the professional career of Yuri Verkhoshansky evolved. In the 1960, twelve of his athletes, students at the Moscow Institutes of Aeronautic Engineering, obtained the title “Master of Sport”. According to the traditions of the Soviet track and field federation, their coach had to be appointed "Honoured Coach of Russia". For such a young coach, this acknowledgement was considered “incredible”. The coaches responsible for granting this commission considered Verkhoshansky's success a chance occurrence. On their recommendation, the nomination was withdrawn. They said of Verkhoshansky, “Let him work a bit more”. Verkhoshansky then took the opportunity to become the head coach of the Moscow United Team in the sprinting and jumping events.



In 1964, Verkhoshansky's athlete Boris Zubov, a student at Moscow University, became both the European and Soviet record holder in the sprint events. As was the case with Verkhoshansky's earlier success, he again was to be nominated for the title of “Honoured Coach of Russia". But, similar to his earlier circumstances, the nomination was again withdrawn. The official reason for the withdrawal was “because of missing documents”. Unintentionally this decision became the best course of action for the development of sports science. Verkhoshansky decided that after again being unfairly denied his accreditation, he would discontinue his coaching career and concentrate his work on scientific research.

His short but exemplary coaching career became of great benefit to his scientific carrier as much of his research was stimulated by his previous empirical findings.

The first of his scientific achievements was the discovery of the **Conjugate-Sequence System**.

The starting point of this concept was the powerful training effect of the Depth Jump. Verkhoshansky observed the effects of this training when his jumpers used it for the first time. After months of the usual heavy work with a barbell, they perceived this new exercise as joke. They enjoyed the ease of the exercise so much that they carried out a great number of Depth Jumps. The following day, none of the athletes came to practice. Their legs were incapable of executing any kind of exercise.

Verkhoshansky would later surmise that Depth Jumps must be carried out with minimal quantity. In addition, they should be included only at the end of the winter strength stage or following the conclusion of the entire preparation period.

At the end of 1960s, his research was directed at studying the Shock Method and its implementation in the training system of speed-strength sport events. The results from these studies demonstrated that only four sets of ten depth jump repetitions were required to increase explosive strength when compared to a higher number of traditional bounds and jumps.

In the article “Depth jumps: are they useful?” (1967), he wrote: “...*The quantity of depth jumps to use in a single training session is related to the level of the athlete’s preparedness. The high level athletes may use these jumps two times a week but not more than 40 jumps. The low level athletes must use not more than 20-30 depth jumps only once a week in two series: first series includes 10 jumps from the height of 0.75 m; second series – 10 jumps from the height of 1.1 m. The athletes, who want to increase the training effect by increasing the height of depth jump can be compared to those zealots who follow the principle: instead to take 15 drops of medicine two times per day, it’s better to drink the whole bottle immediately.*”.

What was overlooked by the researchers was that the powerful training effect of the Shock Method is expressed well when depth jumps are used after a predetermined period of traditional jump training: “*Depth jump is very powerful training exercise. For this reason, it must be gradually introduced in the training process. The best training exercises for the preliminary preparation are: multiple standing jumps and Kettlebell squat jumps... The young sportsmen shouldn’t use depth jumps at all. Multiple jumps and bounds are more useful for them.*”.

This led to the idea that every training mean (a training exercise executed according a given method) has a specific training potential. Each training mean can increase a definite parameter of the athlete’s motor function until that function reaches a certain level. During the systematic use of training means the related motor function increases. However, the training potential of the training means used decreases. Therefore a logical application of training means is necessary. It is more suitable to use the training means with lower potential first, followed sequentially by those having a high training potential.

This finding led to the Conjugate-Sequence system. This system consecutively adds training means into the training process. These means will have the same training direction, but with a different training potential. They are then added to the training plan in a definite sequence in relation to the gradual increase of their training potential.

Years later, Verkhoshansky deduced that different training means could be also concentrated in different training stages of the preparatory period.

By the end of 1970s, the standard of sports achievements had increased to such a degree that sports results accessible to only a few phenomenally talented athletes between the 1930s and 1950s were now merely the basic requirements of the average athlete. To further increase the sports results of the new generation of elite athletes, it was necessary therefore, to find more efficacious training methods compared to those methods used in the past. This brought the first suspicions that, in order to achieve the above mentioned goals, the rules of the traditional Soviet sports training methodology, based on the analysis of the athletes training in the 1950s and 60s, was no longer valid; it needed to be revised.

The first of these suspicions regarded one fundamental truth that had never been queried before: *“to compete better, you must train more”*.

In the 1970s, when the training load volume of elite athletes had been increased to extremes, sports scientists began to search for new ways of achieving improved sports results. Research took two main directions; one group of scientists started to research the non-traditional methods of artificially improving athletes' specific work capacity; this facilitated the possibility of increasing the training load volume. Unfortunately, these studies opened the door to the destructive deadlock of doping into modern sport. However, there was also a positive consequence: scientists began to study the physiological factors that determine an increase in sports results over all sports disciplines; increasingly, the sports training process began to be seen from a physiological standpoint, 'from within'.

Another group of scientists started to search for ways of optimising the training process; of finding out how sports results could be improved without increasing the volume of training loads. A methodological approach based on maximizing specifications and individualising an athlete's preparation was proposed; for elite athletes, who already possessed a high standard of preparedness, it was necessary to elaborate specific sets of parameters for each sports discipline. These parameters would represent the determining factors specific to the improvement of sports results. It was necessary to select the training means that influenced each of these factors and find optimal forms of training loads and temporal organization (scheduling).

In the 1970's, Verkhoshansky was appointed the head of the research laboratory for optimizing the training of elite athletes at the Central State Institute of Physical Culture and Sport. It was during this time that he started to search for new, more powerful methods that would be able to assure an increase in performance of high level athletes.

The initial research dedicated to this project showed that the high total volume of training loads couldn't assure the adequate increase in sport results; most notably because the athletes used the complex-parallel form of temporal organization of training loads of different emphasis. The high total volume of the loads, having complex composition, can't assure the high intensity of training stimuli, because it causes an average reaction within the organism, in which the training effect of one means can negatively affect the training effect of another. The innovative idea of Verkhoshansky consisted of their selective "concentration", directing primarily towards only one training objective. This could create a "persistent/focused" training stimulus, able to influence the most important factor of increasing the sport performance.

One observation of his preceding coaching experience stuck with him.

Though the harsh winter weather of Moscow eventually subsides into spring, the training conditions for the track and field athlete continue to be difficult. Each spring the Soviet athletes would move their training camp to Batumi (Georgia) to train in the warm air that moves westerly from the Black Sea. Here the preparation for the summer competition stage would begin. When Verkhoshansky and his athletes went in Batumi after the first winter dedicated to weight training, his Georgian colleagues remarked, "Yury, what happened with your athletes? They have differ-

ent legs compared to the past years!”. His athletes obtained an unexpectedly high level of specific performance during the spring which followed the winter phase. Indecently, the winter phase was wholly dedicated to strength training.

After a long Russian winter spent enjoying quality time on a daily basis with their “new iron friend”, the athletes wanted nothing more to do with the barbell. They were indeed

happy to finally begin their jumping and running training. Their training started with the execution of a variety of jumping exercises and bounds. They then gradually moved on to more specific exercises and technical event work. The conglomeration of training, and it's systematic implementation was “concentrated” or localised in different training stages, or blocks. These blocks were organized in sequence based on when the implementation of the barbell exercises, jump training and technical work was executed. Following this spring preparation, his athletes started to achieve incredible performances.

Nearly a decade later, Verkhoshansky sought to organize an experiment where the same “concentrated load” phase training was replicated. In order to approve this idea in an experiment, a group of high level T&F jumpers began to use a training program which included only barbell exercises, finalized towards an increase in maximal strength: the barbell exercises, which were, usually, uniformly distributed over time, was concentrated in the limited training stage.

A primary reason for this was that he had in his laboratory new equipment which would allow him to measure the dynamics of strength parameters: the Universal Dynamometric Stand.

The research began with the athletes carrying out the block of barbell exercises as Verkhoshansky's athletes had ten years prior. Unexpectedly the UDS test showed a decrease in strength parameters. According to the current methodological beliefs, these results indicated that the program was not effective. This methodology was based on the Periodization concept of L. Matveev, which



Figure 4 - Batumi, Geoga, spring of 1951. The group of jumpers with their coach Yury Verkhoshansky (on the left). Verkhoshansky with his favourite pupil, Arcadiy Slobodskoy.



Figure 5 - Official picture of TASS for the 1980 Moscow Olympic Games. Y. Verkhoshansky, chief of the Scientific Laboratory of Training Programming and Physiology of Sport Work Capacity.

postulated that a correctly organized training process assures a constant increase in an athlete's physical preparedness. Verkhoshansky found himself at a crossroads. Either cancel the experiment, or continue it in spite of the test results. For a while he didn't take any action. His hope was that he could discover something wrong with the test procedure. As is the case with most circumstances, fate finds a way to intervene. One of Verkhoshansky's test subjects informed him that she had become pregnant and would have to drop out of the experiment and stop training. Verkhoshansky complied with her request, but asked that she continue to be evaluated for the time being. Remarkably, after her respite from training her strength parameters showed an unexpected increase. "It is impossible!" exclaimed Verkhoshansky. Hoping to rule out the anomaly of pregnancy, he decided to complete the experiment and evaluate the other participants along the same parameters as the young woman. These results brought about the same exclamation, "It is impossible!". What he observed was the first instance of the classic "Supercompensation" curve illustrated by a final performance increase of 30%. He immediately organized new experiments to confirm these exceptional results.

Further experimentation and subsequent results lead to the discovery of the **long-term delayed training effect (LDTE)**. The concentrated strength loads caused temporary deficits in the maximal and explosive strength parameters; after concluding the stage of their use, the strength parameters, in the beginning, returned to their initial level and, subsequently, reached an exceedingly high level, which was never achieved by the athletes in his precedent experience. Furthermore, the total volume of barbell exercises, carried out by each of athlete, during the concentrated loads stage, was less than the their total volume, carried out in the whole preparatory period of the previous yearly cycle, in which all these loads were uniformly distributed over time and used together with other training means.

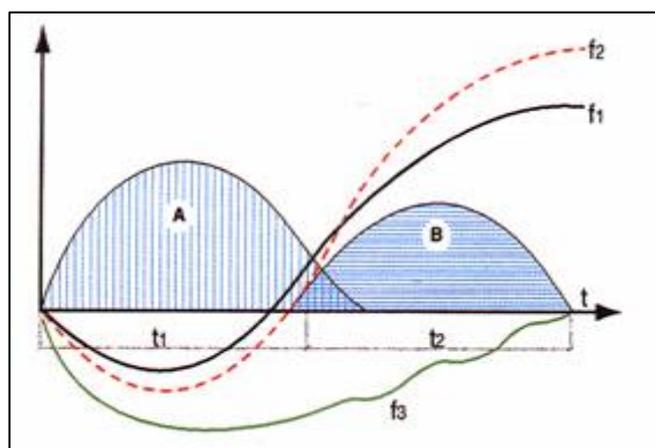


Figure 6 - Basic scheme of the long term delayed effect of the concentrated strength loads.

The series of the subsequent experiments have shown the following:

- Formation of the LDTE has two phases. In the first phase ( $t_1$ ), during the using the concentrated strength loads (A), the athlete's level of maximal and explosive strength are falling, in the second, subsequent, phase ( $t_2$ ) – it is increasing. The lower the strength parameters fall (within an optimal range) during the first phase, the higher they subsequently rise with the LDTE phase (Graph  $f_1$  and  $f_2$ ).
- An excessive volume of the concentrated strength loads (A) results in a significant drop in the athlete's state and, as a rule, a disruption of adaptation (Graph  $f_3$ ).

- The duration of LTDE is determined by the volume and by the length of the concentrated strength loading (stage A). In general, the phase of LDTE realization ( $t_2$ ) is equivalent to the duration of the precedent phase ( $t_1$ ). The optimum duration of the concentration stage of strength loads (the block A), that assures the fullest use of the adaptive potential of the athlete's organism and the greatest increase of strength parameters in the subsequent period, ranges from 6-12 weeks.
- During the phase of loading (A) and decreasing strength parameters ( $t_1$ ), the athlete has a difficulty to execute the competition exercise with the correct technique and with the high level of power output.
- The low volume of speed-strength exercises, carried out by gradually increasing their intensity, creates a favourable condition to the realization of the LDTE in the subsequent period (B).

The last two observations showed, that, in order to realize the LLTE, reaching the highest improvement of speed-strength sport performance, the stage of concentrated strength loads should be followed, subsequently, by the stage of concentrated explosive strength loads and the stage of the training work aimed to improve the technique of executing the competition exercise at the highest level of power output.

...At the end of 1980's, after many years of research, Verkhoshansky presented the results of his experiments for the first time in the West at the International Sports Science Seminar. When he presented the slide that illustrated the Supercompensation curve of these experiments, well known German physiologist Alois Mader echoed a familiar refrain, "It's impossible!". Verkhoshansky's response conveyed his own initial reaction "Colleague, your words are exactly the same which I pronounced when I looked on these curves for the first time".

Subsequent studies of the practical application of LDTE led to the creation of an innovative yearly cycle for which to model speed-strength sport disciplines. In the 1980s, this training model came to be called the '**Block Training System**'. It was successful and soon became the dominant model used in training elite Soviet athletes.

Although they were praised as innovative, the aforementioned discoveries were specific only to the speed-strength sports. The endurance disciplines relegated the use of resistance exercises exclusively to the athlete's general physical preparation. Furthermore, the use of barbell exercises as a means of special physical preparation was dismissed as ineffective. It would take advanced physiological research data to break these convictions.

In the 1970s many research experiments deduced that physiological parameters from laboratory tests characterize the athletes' physical fitness level more precisely than endurance parameters estimated through motor tests. At the time the maximum oxygen consumption ( $VO_2$  max) was considered to be the most important indicator of endurance motor ability. Therefore, all research utilized the  $VO_2$  increase index as the most effective parameter of evaluation of endurance

training. It would be a decade until physiological research data showed that the the capacity to consume a larger quantity of oxygen was less important than the capacity of the muscles to use oxygen more effectively during prolonged physical exercise. This concept came to be known as Local Muscular Endurance (LME). LME is dependent on the physiological characteristics of the muscle fibers. The specific composition of the fibers involved in the work, the oxidative capacity, and the contractile ability of the fibers contribute to LME.

Verkhoshansky's research showed that LME could in fact be influenced by the use of resistance exercises. He advocated that it would be most effective if carried out at appropriate intervals and combined with prolonged aerobic exercise. Logic then led to the conclusion that the Block Training System could also be applied effectively to endurance sports<sup>6</sup>. The “construction” of this Block Training System model has more complicated particularities, in comparison to the BTS model for speed-strength sport disciplines. However, the basic element, in both this models, is the LDTS of concentrated strength loads, used at the beginning of the preparation period.

The basic idea of BTS consists of the creation of the conditions, which facilitate the consecutive increases in the functional level of the organism's physiological systems, “responsible” for increasing the athlete's specific work capacity (increase in motor potential), and subsequently, to improve the bidirectional links between these systems and the motor control system (improvement of the athlete's capacity to realize his motor potential in the competition exercise).

Increasing the functional level of physiological systems, in every sport discipline, regards those systems, which assure the performance of the competition exercise with higher power output: in speed-strength sports – it mostly regards the neuromuscular system, in endurance, combat sports and sport games – it regards also the energy supply and cardio-vascular systems. However, the functional power of all these systems can be expressed by the same executive organ – skeletal muscles. Therefore, increasing the functional level of the neuro-muscular system is a fundamental basis for increasing the power produced by muscle contractions in the specific working regime, typical of a given sports discipline. In other words, for improving the athlete's “specific work capacity”.



Figure 7 - Moscow, end of 70'. Y.Verkhoshansky with Igor Ter-Ovanesian, head coach of Soviet Track & Field National Team (jumping events) and Valerij Podluznij (8.18m long jump bronze medalist, Moscow Olympic Games, 1980)

<sup>6</sup> For the first time the Block Training System for endurance sports was described in the articles of Y.Verkhoshansky, published in the journal “Nauchno-sportivny vestnik” (“Messenger of Sport Science”) in 1984 (n.3), 1985 (n.1), 1986 (n.4) and later, a German version in “Ein neues Trainingssystem fur zyklische Sportarten. Ein neuer Weg der Gestaltung und Programmierung des Trainingprozesses”, Philippka-Verlag, 1990.

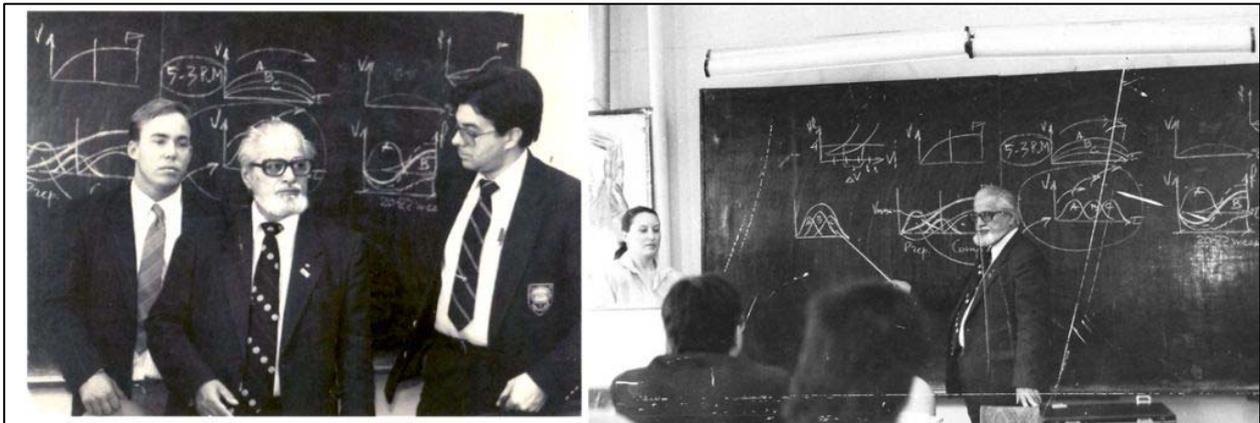


Figure 8 - Moscow, 1989. National Institute of Physical Culture and Sports Sciences; the first sports medicine course in the former Soviet Union through the USSR Sports Committee and the American Institute of Certified Educational Planners - AICEP. On the left - Prof. Y. Verkhoshansky explains the Block Training System. On the right; after his lecture with Dr James Stoxen DC (left) and Dr Steven Press DC PhD (right).

Improving the athlete's capacity to realize the motor potential in the motor structure of the competition exercise regards setting up bidirectional links between the physiological mechanisms, which assure mobilization of the motor potential to work in a specific regime and the CNS and neuro-muscular mechanisms, which assure the motor control function.

This basic idea is applied with the following training strategy.

In **block A**, the concentrated strength loads ensure the powerful impact on the neuro-muscular system that leads to a temporal decrease in the functional power of this system and, as consequence, decreases the athlete's specific work ability.

During the subsequent **block B**, the long-lasting delayed training effect of concentrated strength loads leads to the progressive increase in the athlete's work ability. To fortify this increase and to direct the delayed morphological-functional transformations toward the needed way, the training exercises in the specific regime are used; by gradually increasing their intensity (the level of power output).

In **block C**, to acclimate the athlete to making complete use of his progressively growing specific work ability in the motor structure of the competition exercise, the technique work is carried out: the execution of the entire competition exercise and its elements at the level of maximal power output. This work is aimed to adjust the biodynamic structure of the competition exercise: to put it in accordance with the increased motor potential of the athlete.

The Block Training System is intended only for high level athletes. Consider the following two points:

1. The concentration of training loads is the last way to increase the training potential of training loads, which is useful only for those athletes who have already exhausted all other possibilities to obtain an increase in their physical fitness level.

2. The concentration of training loads could lead to such alterations of fitness parameters, which create the difficulties to adjust the biodynamic structure of the competition exercise in the subsequent training period. Only high-level athletes, who possess a high level of technical mastery, could tolerate such alteration.

The second point also indicates the difficulties in applying the BTS in those sport disciplines, in which the competition exercise has a very complicated motor structure and requires high precision of movement.

The Block Training System can be applied only as a specific training model for the given sports discipline. Consider the following three points:

1. The power output of the competition exercise is assured by the involvement of different structural elements of the physiological systems of the human body, integrated into the particular specific functional structure. The final aim of the BTS is the enforcement of this entire structure through the use of concentrated training loads, which acts on each of these elements in a determined sequence. In different sports disciplines, the structural elements of these physiological systems may not be the same. Their difference determines not only differences between the training means used in each block, but also the general composition of the Block Training System models.
2. The process of the organism's morpho-functional specialization is characterized not only by multilateralism (involvement of different structural elements of the physiological systems of the body), but also by heterochronism (different adaptive inertia of these systems). For this reason, the loads, which stimulate each component of the specific functional structure, must be conjugated in a determined sequence; the length of their action will not be the same.
3. The length of the entire BTS program is determined by the length of the preparation period; this will vary according to the competition calendars used in different sports disciplines.

Professor Yuri Verkhoshansky was one of the greatest experts in the theory of sports training. For many years he was the head of the commission that led the Institutes of Physical Education and Sport scientific research for all the USSR countries as well. These institutes elaborated the training systems for the high-level

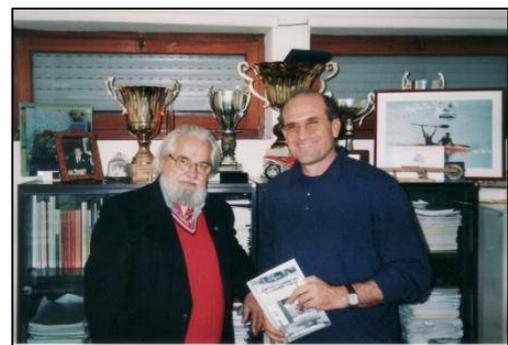


Figure 9 - Rome, 2000s. Y. Verkhoshansky with Oreste Perri, Italian National Canoeing Team coach.

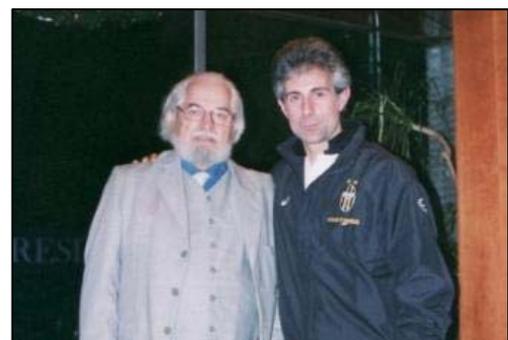


Figure 10 - Y. Verkhoshansky with Gianpiero Ventroni, at that time physical preparation coach of the Italian soccer team "Juventus F.C."

athletes and allowed others to benefit from his research and findings. He assisted, together with his collaborators, the preparation of Soviet national sports teams for the Olympic Games and other international competitions. Since 1995, Professor Verkhoshansky's focus has been as a scientific consultant for the National Olympic Committee of Italy. For this and more, he was formally acknowledged for his contribution to the development of Italian Sport.



Figure 11 - Rome 2008-2009. On the left - Y. Verkhoshansky with Nils Holmdahl, Sweden National Volley Ball Team coach. On the right - with Mark Bennet Welsh National Rugby National fitness coach.

On 23 June, 2010 Yuri Verkhoshansky died in Rome, Italy at the age of 82 after a lifetime of dedication to improving Olympic sports training.

For the most part of his professional life Y. Verkhoshansky worked, not with athletes, but with their coaches. He did not teach them how to train their athletes; he worked with them, so that coaches and their athletes were able to find solutions together.

The main part of his training methods and programs were elaborated in collaboration with these coaches and proved by their athletes. To find ways of successfully putting them into practice, it is necessary to try and fully understand not only how these programs have been compiled, but also, why they guarantee better results with respect to other programs. Their successful interpretation through your own coaching and training experience depends on highlighting two points: the essence of these programs which cannot be changed and the variable details which may be adapted to your particular sporting discipline.

*Natalia Verkhoshansky*

## TABLE OF CONTENTS

|    |   |     |
|----|---|-----|
| 1  | PREFACE .....   | I   |
| 2  | INTRODUCTION.....                                     | 1   |
| 3  | SHOCK METHOD .....                                    | 1   |
| 4  | BLOCK TRAINING SYSTEM .....                           | 21  |
| 5  | JUMP TRAINING.....                                    | 61  |
| 6  | SPORT SPECIFIC QUESTIONS.....                         | 74  |
|    | COMBAT SPORT .....                                    | 74  |
|    | SAILING .....   | 76  |
|    | MUAY THAI .....                                       | 76  |
|    | AMERICAN FOOTBALL .....                               | 77  |
|    | SWIMMING.....   | 80  |
|    | GYMNASTICS .....                                      | 81  |
|    | BOBSLED .....   | 82  |
|    | WEIGHTLIFTING (OLYMPIC AND POWER).....                | 86  |
|    | WRESTLING .....                                       | 92  |
|    | BOXING.....   | 93  |
| 7  | SPECIAL STRENGTH TRAINING .....                       | 95  |
| 8  | TERMINOLOGY REFERENCE.....                            | 105 |
| 9  | TRACK AND FIELD.....                                  | 109 |
| 10 | PERIODIZATION AND GENERAL PRINCIPLES OF TRAINING..... | 127 |
| 11 | RECOVERY AND RESTORATION .....                        | 140 |