KEY POINTS TO KEEP IN MIND BEFORE APPLYING SST MEANS IN THE TRAINING PROCESS

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CLARIFYING THE OBJECTIVE

The essence of sport competition activity lies in the movements of the human body.
Sports movements are not simple changes of body positions in space: in every sports discipline, without exception, they represents a **complex motor actions** finalized to solve determined **motor tasks**.
It can be a single motor task, aimed at obtaining the quantitative goal as in Track & Field sports disciplines, or at obtaining the qualitative goal, determined by the experts (sports referees), as in gymnastics and figure skating. In team sports and combat sports, it is necessary to solve several motor tasks, which conform to the rules of competition in order to achieve the final goal - win the match or beat the opponent.
Solving the motor task of every complex motor action accomplishes through appropriate *motor pattern* – the sequence of movements arranged in space and time. In sport, it is the competition exercise, which represents a system of movements, aimed at achieving a specific goal, in specific conditions, under the competition rules.
The final goal of competition exercises in Olympic sports ('Citius, Altius, Fortius' – 'Faster, Higher, Stronger') may almost always be related to the capacity to express power produced by the speed of movements and by the force of overcoming external resistance.
Consequently, the training process, focused on improving the sports result, could be definite as the process of increasing the **power output** of competition exercise.

ANALYZING THE COMPETITION EXERCISE FROM BIOMECHANICS POINT OF VIEW

Human movement represents an interaction between the human body and the external environment (A. Bernstein).
Analyzing every competition exercise from a *kinetics*[1] perspective, it may be assumed, that during its execution, not only the *active* driving forces are produced by muscular contraction, but also the *reactive* forces, which are activated as consequence of the impact of active forces to the external environment:

- gravity force (body weight or its links);
- reactive forces arising as a result of the interaction between the active forces and the

[1] *Kinetics* - is one of the branches of dynamics, concerned with what body movements are produced under the action of particular forces. Not to be confused with kinematics, the study of motion without regard to force or mass.

environment;
- force of body (or its links) inertia;
- force stored in the muscle-complex as elastic energy during the preparatory phases of movements.

To achieve its goal, the competition exercise must be executed according to pre-determined spatial-temporal characteristics, which assure the possibility to overcome external and internal forces formed for solving the motor tasks.
Considering that the "tool" used to execute movements is human body, the competition exercise must be rationally organized in a defined *kinematic*[2] structure, in conformity with the anatomical and functional particularities of the human motor apparatus.
Therefore, increasing the power output of competition exercise regards increasing the body capacity to generate the active force to overcome the external and internal opposition and the acquisition of specific skill to control the body movements.

INCREASING THE FORCE GENERATION CAPACITY OF HUMAN BODY

To obtain a necessary kinematic characteristics of the complex motor action, the motor control system operates not at the level of single muscle, but at the level of innate functional components of the human motor apparatus, called **working mechanisms**, involving them in appropriate ratio to solve a given motor task.
The most important working mechanism of human motor apparatus regards the so named **muscle synergies**:
- the muscle groups, agonists and antagonists, whose synchronized contractions provoke the movements of body segments in a given direction;
- the muscle groups, which assure *elementary postural reflexes* (the involuntary force efforts helping to maintain the body posture during the displacements of the centre of body mass and its links).

The other working mechanisms, which could be used by the motor control system as particular components of human motor apparatus, are:
1) *muscular system tonus* - a stable state of muscles' contraction, which assures the readiness of the whole muscular system to execute movements;
2) *elastic properties of muscles* - the force stored in the muscle complex as elastic energy;
3) *rational succession of different muscles recruitment* - the particular system of reflexes, assuring the rational subsequent activation of the muscles specific to different body segments during the execution of complex movements.

The higher is the functional level (force generation capacity) of the working mechanisms involved in a given competition exercise, the higher is the athlete's *motor potential*, which determines his capability to execute this exercise with higher power output.

The force generating capacity the working mechanisms may be improved by using the SST means. Resistance exercises are able to increase the traction force of the main muscular synergies involved in competition exercise. First of all, they can increase the traction force of the muscle synergies producing the so named *anti-gravitational force* efforts. In the speed-strength sports, these muscle synergies produce powerful anti-gravitational force effort in the final phase of competition exercise; in endurance sports – the *body propelling force-effort* in each cycle of locomotion (ground propulsion in running or water propulsion in swimming and rowing).
The free-weight exercises are also able to improve the elementary postural reflexes and to increase the tonus of the muscular system as a whole. Jump exercises are able to improve the effectiveness of using elastic properties of muscles.

[2] *Kinematics* - dealing with the implications of observed motions without regard for circumstances causing them.

IMPROVING THE BIODYNAMIC STRUCTURE OF COMPETITION EXERCISE

From kinetic prospective, specific *motor pattern* (the sequence of movements arranged in space and time, which conform the competition exercise) could be seen also as a specific pattern made by simultaneous and sequential phases of force application (force efforts) which assure the possibility to overcome external and internal forces.
During the process of assimilation of the correct technique, some of these phases of force application become more accentuated with the change of electrical activity of the muscles involved. When the athlete achieves a certain level of technical mastery, these phases become more accentuated and more interrelated, forming a stable system of interactions, called **biodynamic structure**, in which some of the force application phases hold dominant while others hold subordinate roles in achieving the final goal.
Therefore, the system of movements, which compose the competition exercise can be divided into two fundamental components:

- the key-movements, crucial for managing motor tasks, as well as for producing the resulting power output;
- secondary movements, which assist the key-movements during the competition exercise execution.

It means that, to increase the power output of a given competition exercise it is necessary:

1) to increase the working effect of its key movements;
2) to improve the efficiency of interaction between key-movements, and between the key-movements and the secondary movements.

Both these tasks may be solved by using SST means.
To increase the working effect of the key-movements of competition exercise, the so named **local exercises**, having single motor structure, must be used. The local exercises are chosen on the base of the **Dynamic correspondence Principle**.
To improve the efficiency of interactions between the key-movements and the secondary movements of competition exercise, the so named **global exercises**[3], having complex motor structure, must be used. The global exercises should reproduce the competition exercise as whole or the main technical-tactical elements of the competition activities under more difficult conditions.

INCREASING THE WORKING EFFECT OF KEY-MOVEMENTS

The **working effect of movement** is the mechanical work produced by movement as a result of active interaction between the body and the external environment. The working effect of movement is determined by the character (evolution over the time) of the force effort developed by the muscles involved in the movement.
The results of researches pointed out a common characteristic to be achieved for the improvement in sport performance: the increase in magnitude of force-effort employed in the key movements and the decrease in the time of its employment.
However, the different conditions under which the neuro-muscular system works during the execution of different competition exercises recall different mechanisms for assuring these changes.

[3] The terms 'global' and 'local' are usually used to identify, respectively, the exercises involving a large volume and small volume of muscles. In our contest these terms are referred to the motor structure of competition exercise.

These mechanisms are related to the activation of different functional characteristics (options) of the neuro-muscular system (the motor unit recruitment, the motor unit activation frequency, the motor unit synchronisation and others), which are usually associated with the strength capability.
The basic forms of these functional characteristics expression were identified as the basic strength capabilities:

- **Maximal Strength** (P_0) - the greatest magnitude of the voluntary force-effort, which the athlete able to display in isometric regime when there is no time limit to complete the task.
- **Explosive Strength** (J) - is characterized by the athlete's capability to achieve the maximal force-effort (F_{MAX}) in the shortest time (T_{MAX}): $J = F_{MAX}/T_{MAX}$.
- **Starting Strength** (Q) - is characterized by the athlete's capability to produce rapid increases in force-effort at the start of muscular tension. It is measured by the so named Starting Strength gradient: S-gradient = $F_{0,5\ MAX} / T_{0,5\ MAX)}$.
- **Accelerating Strength** (G) - is characterized by the athlete's capability to rapidly achieve the maximal value of force effort (F_{MAX}) in the final phase of muscular tension. Usually, it is measured by the so named Acceleration Strength gradient: A-gradient = $F_{0,5\ MAX} / (T_{MAX} - T_{0,5\ MAX})$.

In movements, executed with different levels of external opposition, the basic strength capabilities could have not equal relevance in obtaining the highest working effect.
For example, when the force-effort is displayed in high speed movements with a small external resistance, its magnitude is determined by the so-called **High-Speed Strength** (Fv), strictly correlated with the Starting Strength (Q). As resistance increases, Explosive and, after, Accelerating Strength become more important.

Basic strength capabilities expressed in different regimes of muscular contraction usually require activation of different functional options of neuro-muscular system.
For example, the capacities to generate maximal force in the isometric and dynamic regimes of muscular contraction are assured by different neuro-muscular mechanisms, which are relatively independent of each other in their functional display and development.
Also the capacities to generate force in overcoming ("concentric") and yelding ("eccentric") regimes are related to different neuro-muscular functions: "*The greater cortical signal for eccentric muscle actions suggests that the brain probably plans and programs eccentric movements differently from concentric muscle tasks.*" (Yin Fang et al., Journal of Neurophysiology, 2001, vol. 86 n. 4).
However, an important consideration to keep in mind is that sports movements are usually executed in a mixed regime of muscular contraction.
For example, during a single explosive movement in which the athlete has to displace a heavy load from a standing position, before initiating the movement, the muscles work in an isometric regime. As soon as the developing isometric force-effort achieves the level of the opposite resistance force, the movement starts and the muscles begin to work in the dynamic regime.
In the so-called 'starting movements' executed without 'countermovement' against heavy resistance (for example: the body static inertia), the major role is played by Maximal Strength (Po) and the Explosive Strength (J), expressed in isometric regime.
When the explosive movement is executed with 'countermovement', i.e., in the reversal yielding-overcoming ("eccentric-concentric") regime, the major role is played by the Explosive Strength (J) expressed in the overcoming ("concentric") regime.
In reversal movements, executed in the rapid transition from the yielding ("eccentric") to the overcoming ("concentric") regime, two other functional characteristics of the neuro-muscular system are used: the **Reactive Ability of neuro-muscular system** (the capacity to develop the highest value of force in the overcoming phase due the stimulation of muscle proprioceptors during the yielding phase) and the **Elastic properties (potential) of muscles** (which provides an

extra source of energy assuring the enhancement of the subsequent muscular contraction).

Thus, in relation to the specific character of the force effort applied in a given key- movement, each of different functional characteristics of the neuro-muscular system may have specific relevance in obtaining its highest working effect.
Each of these functional characteristics can be effectively improved using determined SST exercise in an appropriate regime (i.e. according to an appropriate method). As a rule, to obtain an increase in a given functional characteristics, SST exercise should emphasize its maximal expression. For example, to increase Explosive Strength (J), the force effort of exercise has to be developed explosively; to increase the Maximal Strength (Po), the time of force employment in the execution of the exercise has to be not limited.
Considering that different training means, used together in the training process, elicits an integrated morpho-functional adaptation (Cumulative Training Effect), a determined combination of different SST means can be used to improve the working effect of a given key-movement. These training means should be integrated in a *training means system.*

INTEGRATING TRAINING MEANS IN A SYSTEM

Training means system[4] is a group of different exercises, in which each training means solves its specific motor task, but the combined effect of them allows to attain a global training task aimed at increasing the power output of competition exercises.
The following study illustrates how the SST means system can be formed.
The aim of this study was to find out the training means able to increase the speed of specific tennis displacements. Tennis displacements are characterized by the complex (compound) trajectory with frequent stops and immediate changes of the running direction. The take-of movements during the specific running are executed with the flexed legs. As it was presumed, to perform these kinds of displacements, without loosing speed, the athlete should have a high level of isometric strength of the main muscle synergies involved in the lateral and frontal changing directions.
In the experiment, 19 high level tennis players performed two groups of tests: specific speed running tests and strength tests.
The specific speed running tests consisted in performing the most typical tennis game's displacements[5] (see Fig. 1):

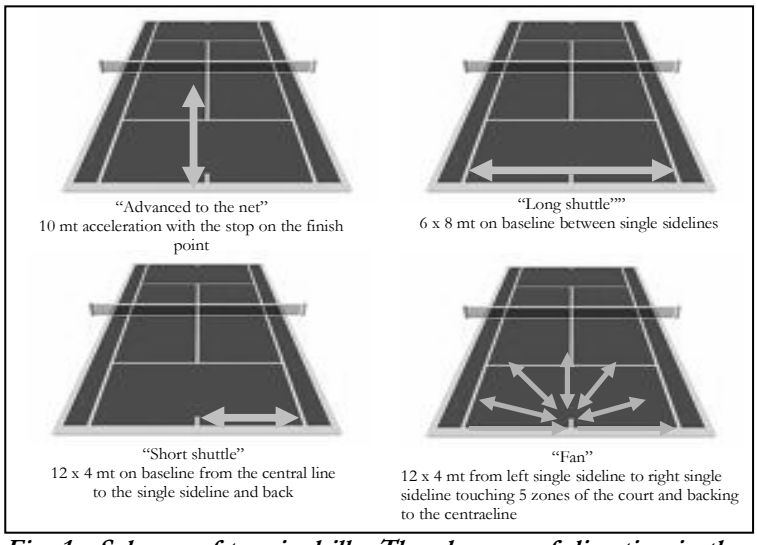

Fig. 1 - Scheme of tennis drills. The changes of direction in the left-right placements must be executed without rotating the body – the athlete must always face the net.

[4] *System* (from Latin systēma, in turn from Greek σύστημα systēma) is a set of interacting or interdependent entities, real or abstract, forming an integrated whole. The concept of an "integrated whole" can also be stated in terms of a system embodying a set of relationships which are differentiated from relationships of the set to other elements, and from relationships between an element of the set and elements which are not a part of the relational regime. System thinking is based on Aristotle's idea: 'The Whole is more than the sum of the parts'.
[5] These forms of tennis displacements were individuated, in a precedent study, as the most frequently used during the tennis matches of the high level players.

1) forward running on 10 meters distance with the stop at the finish point ('Advance to the net');
2) running on 48 meters distance with different trajectories:
   - 'Long Shuttle', 6 × 8 meters with 5 lateral (side-to-side) changes of directions;
   - 'Short Shuttle', 12 × 4 meters with 11 lateral changes of directions;
   - 'Fan', 12 × 4 meters with 11 both lateral and frontal changes of directions.

In the strength tests, the level of basic strength capabilities were evaluated using the UDS: Maximal (P_0), Explosive (J) and Starting strength (Q) expressed in the maximal isometric strength efforts and maximal explosive isometric strength efforts of the Leg Press and Seated Calf Raise.
The table 1 shows the correlations between the results of the running and strength tests.
The correlations indicate that the higher is the level of explosive strength (J) of the tennis players, the higher is their capacity to run rapidly on a court. So, for increasing the tennis specific speed ability, the athletes should use SST means, able to increase Explosive Strength expressed in the take-off movements: first of all, jumping exercises.
The results showed also that the athletes who expressed the higher value of P_0 in Seated Calf Rise (but not in Leg Press) showed high level of speed ability. This means that to increase the speed is advisable to use a training method able to increase the weight of 1RM in Seated Calf Rise exercise.
As we can see, the results of specific running tests are not correlated directly with the Maximal Strength expressed in Leg Press. However, the correlations between the parameters of strength capabilities (Table 2) show that, the higher is the level of Maximal Strength (Po), the higher is the level of Explosive Strength (J).

	Leg Press			Seated Calf Rise		
	Po	J	Q	Po	J	Q
Advance to the net	0.075	**-0.536**	-0.156	**-0.503**	**-0.541**	**-0.442**
Short Shuttle	0.086	**-0.593**	0.018	**-0.488**	**-0.511**	**-0.446**
Long Shuttle	0.185	**-0.595**	-0.308	**-0.442**	**-0.454**	**-0.437**
Fan	-0.299	**-0.513**	-0.149	**-0.436**	**-0.485**	**-0.446**

Tab. 1 - The correlations between the specific tennis speed parameters (running tests) and several strength parameters: maximal (Po), explosive(J) and starting (Q) strength, expressed in the maximal explosive strength effort of the Leg Extension ("Leg Press") and the Seated Calf Raise ("Soleus"). R = 0.433 (5%), n = 19.(N.Verkhoshansky, 1984).

It means that, to increase the level of Explosive Strength in Leg Press and, as consequence, to increase the speed of specific tennis displacements, it's necessary to increase the maximal strength expressed in the Leg Press. This means that to increase the speed is advisable to use a training method able to increase the weight of RM in Leg Press exercise (barbell squat).

During the running test procedures, it was evidenced that the tennis players, involved in this experiment, had different levels of the specific skill of performing tennis displacements. This difference could influence on the level of correlation between the speed and strength tests.
To evaluate the level of this influence, it was done another experiment, which analyzed the correlations between the results of 'Long Shuttle' and 'Short Shuttle' and the tests on Explosive Strength in the

		Leg Press			Seated Calf Rise		
		Po	J	Q	Po	J	Q
Leg Press	Po	1					
	J	**0.803**	1				
	Q	0.354	**0.692**	1			
Seated Calf Rise	Po	0.332	**0.545**	**0.461**	1		
	J	0.140	**0.499**	**0.533**	**0.837**	1	
	Q	0.047	0.399	**0.588**	**0.692**	**0.880**	1

Tab. 2 - The correlation between the strength parameter (the maximal - Po, explosive -J and starting - Q strength) of the maximal isometric explosive strength effort, expressed by Leg Extension ("Leg Press") and Seated Calf Raise ("Soleus") in the group of tennis players group. R = 0.433 (5%), n = 19. (N.Verkhoshansky, 1984)

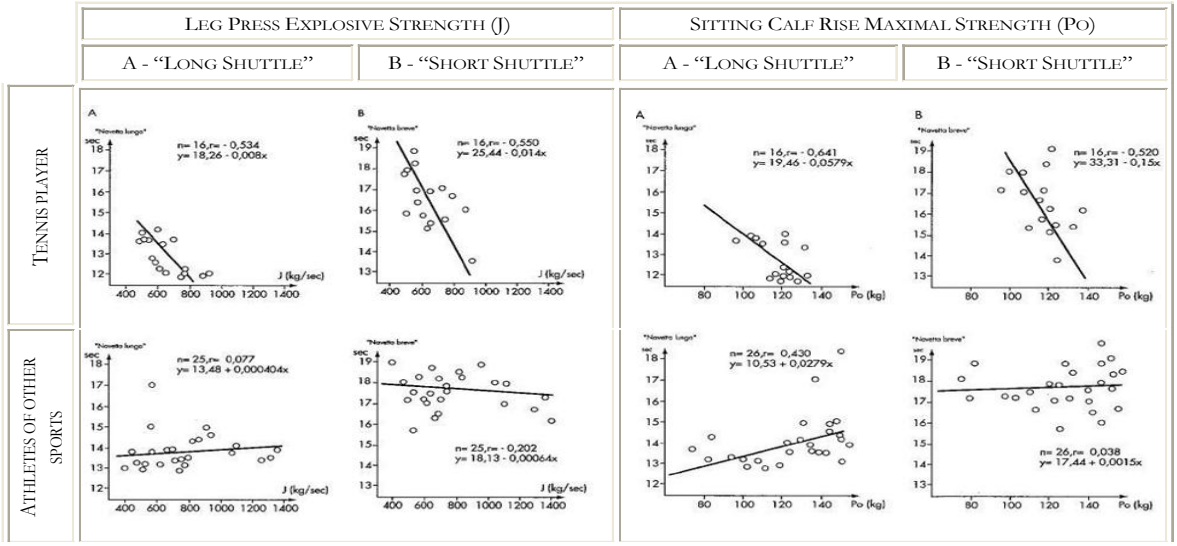

Fig. 2 - Relationships between the results of the test "Long Shuttle" and "Short Shuttle" and strength capabilities (P_0 and J), in two groups of athletes: tennis players (above) and athletes of other sports (below). N. Verkhoshansky, 1984.

Leg Press and on Maximal Strength in the Seated Calf Raise for two groups of athletes: a group of tennis players and a group of athletes specialized in other sport disciplines (8 rowers, 2 skiers, 7 Track & Field runners, 6 boxers and 2 gymnasts).

As we can see in the figure 2, the results of the group of tennis players showed a very high level of correlations, while the results of the group of other sports athlete didn't show any correlation. The athletes, specialized in the other sports, had higher level of strength preparedness than the tennis players. Notwithstanding this, they were not able to realize their motor potential in the motor structure of the specific tennis displacements.

This indicates that the speed of the specific tennis displacements depend also on the specific technical skill, which can be improved through the execution of specific tennis running exercises.
Summarizing the results of this study, it's possible to assert that, in order to improve the specific speed ability, the tennis players should use combinations of several training means: barbell exercises, jump exercises and specific speed running exercises. These means can be combined in the same training session or in different training sessions of the same microcycle and can be used also in the Block Training System.

Thus, in every sport discipline, the increase in power output of competition exercise may be obtained by the improvement of several strength parameters combined in a specific structure. In order to improve each of these parameters, it is possible to use different training means or a combination of them.
A SST means system should include not only training means focused on improving determined strength capabilities (maximal strength, explosive strength, high-speed strength), but also the training means focused on increasing the strength potential of the main muscle synergies involved in the competition exercise. In endurance sports, combat sports and team sports, the SST means system should include also the exercises aimed at improving the Maximal Anaerobic Power and the Local Muscular Endurance.
So, there could be many SST means at the disposal of a coach to improve the power output of competition exercise. The choice of the SST means will effectively fulfil this task only when the means are:

- integrated in a system in which the training task of every means is designed in relation to the other tasks;

- integrated in a common system of training, i.e., the means are rationally combined with the other means used in the training process.

The cumulative training effect, obtained by this training means system, is not sum of training effects of different training means used, it depend on the sequence of their use (the form of their temporal organization) in training session and also in training process as whole.
The main goal of the whole system can only be achieved when, in the training process, the means are temporally organized in such a way that each of them effectively fulfils its own particular task, and at the same time, all of them, together, allow the athlete to achieve the required level of special work capacity with the minimum expenditure of time and energy.

PROGRESSING TRAINING MEANS DURING PREPARATION PERIOD

The training process, especially of high level athletes, must be highly specialized: the athlete must not perform useless activity that can't positively contribute to the attainment of the specific objective.
This does not mean that each training exercise must reproduce the competition exercise; the specific aim must be attributed to the whole training means system and to the whole training stimuli system of training loads used in the preparation period.
As outlined above, the SST means system should include a large spectrum of exercises aimed at improving different determining factors for increasing the power output of competition exercises. So, these training means should have different training directions (for improving different strength abilities and different functional properties of different muscle groups), different training potential levels and also different levels of specificity (level of dynamic correspondence to the competition exercise).
There are two aspects of the training means specificity that must be considered.
The first aspect regards the correspondence of the training means to the motor structure of competition exercise.
The training means included in the SST means system can have two levels of specificity; they should be used in the preparation period in the following sequence:

- less specific exercises, for preparing the athlete's motor apparatus (the working mechanisms of his body) to more specific exercises with higher training effects and for helping to avoid injury;
- highly specific exercises, for assuring the increase of the force-efforts in the key movements;

The second aspect regards the training means correspondence to the specific character of the power output in the competition exercise.
Each training means included in the SST system must assure an increase in those functions of the organism which determine increasing the power output of muscular work in the specific regime (characteristic of the given sport discipline). Since the power is determined by two components, force and velocity, the training means included in the SST means system must be able to emphasize:

- the magnitude of the force-effort in specific movements;
- the velocity of increasing the magnitude of the force effort.

In the preparation period, the SST means aimed at increasing the magnitude of force effort must precede the SST means aimed to increase the rate of force development.
Considering these two aspects of specificity, the SST means must be introduced in such sequence for solving the following training tasks:

1) enforcing the main muscular synergies and the other body's working mechanisms, involved in the competition exercises;
2) increasing the magnitude of force effort in the key movements;
3) increasing the speed of the force employment in the key movements.

In Fig. 3, it can be seen how this rule is applied for increasing the power output of the Track & Field jumps through the following phases:

1) bounds - for getting the motor apparatus ready for executing the subsequent training loads;
2) barbell exercises - for increasing the force component of the take-off power output;
3) kettlebell jumps - for increasing the speed component of the take-off power output;
4) depth jumps - for increasing both the force and speed components of the take-off power output through the use of highly intensive training stimuli.

This rule also implies that one type of exercise is gradually replaced by another. The previous SST means must assure the functional-morphological basis so that the positive training effect of the subsequent SST means is felt. At this stage, the exercises which follow continue to further enhance the adaptive changes acquired by the organism on a higher level of specificity.
This schedule of training loads is called the Conjugate-Sequence System.
A similar approach was used to create Conjugate-Sequence System for Track & Field throwers and middle distance runners (see Fig. 4).

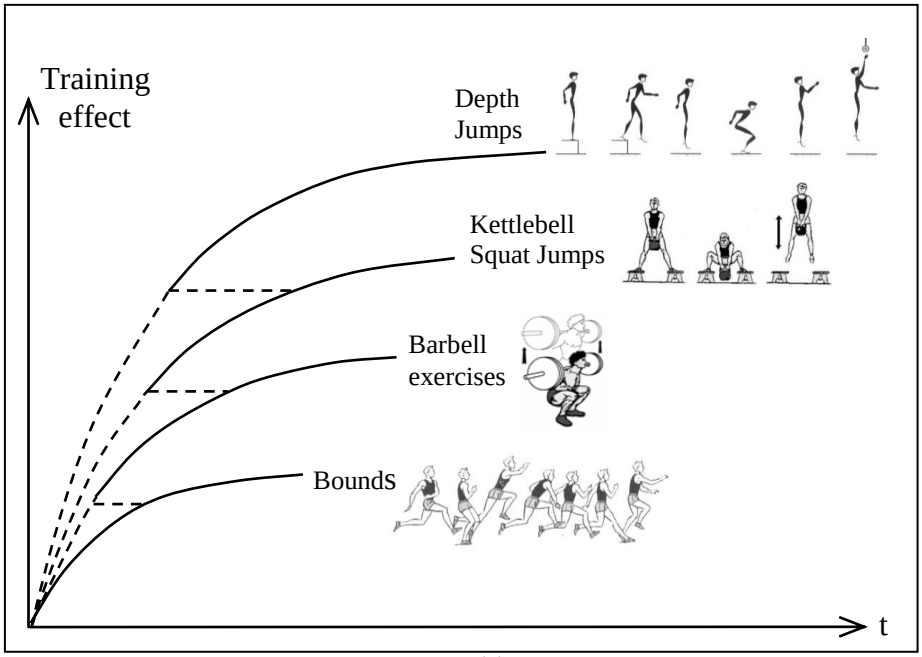

Fig. 3 - Conjugate-Sequence System of SST means finalized at the improvement of explosive strength of Track & Field jumpers (Y. Verkhoshansky, 1970).

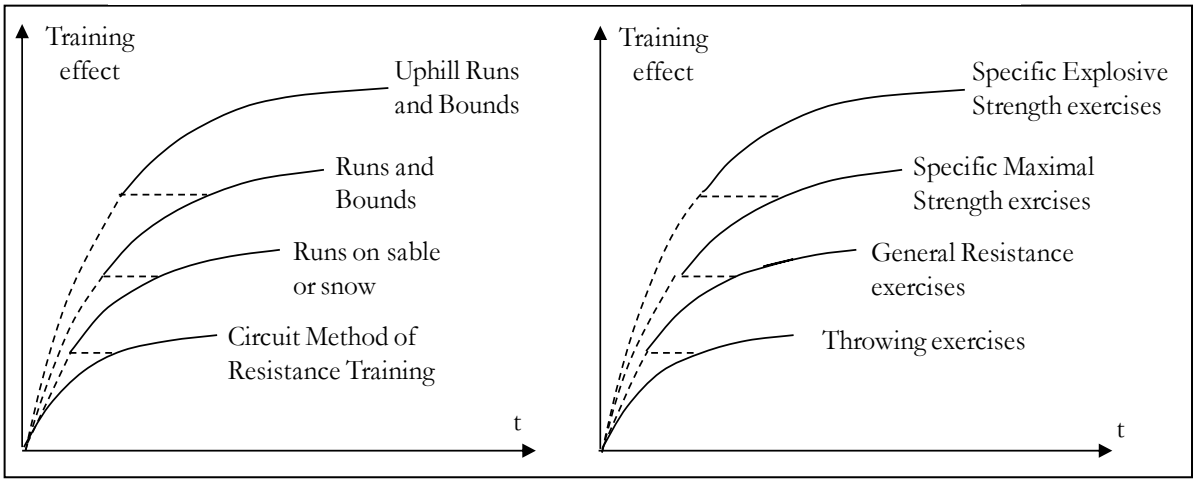

Fig. 4 - The schema of the Conjugate-Sequence method using SST means: right - for Track&Field throwers (P.Tshine, 1978), left - for Track&Field middle distance runners (A. Nurmekivi, 1974)

SHARING OUT THE RESISTANCE EXERCISES IN TWO MAIN GROUPS

The most important means used in SST are the resistance exercises, referred to as exercises with overload. Usually they are known as weight training, because the most part of resistance exercises are executed with weights (additive external opposition to increase the force of gravity): 'free weights' (barbells, dumbbells and others) or weights fixed by a system of blocks/stacks in cable apparatus (lever operated machines).
In selecting SST means for a given sport discipline, it is necessary to consider two main groups of resistance exercises:

- First group of exercises aimed at increasing the working effect in the key movements of the competition exercise;
- Second group of exercises aimed at preparing the athlete's motor apparatus so that the first group of exercises can be carried out with a higher training effect and with less danger of injury for the athlete.

In the training load schedule during the preparatory period, the second group of exercises must precede the exercises of the first group.
The resistance exercises of the first group should be selected by strictly applying the Principle of dynamic correspondence. Resistance exercises of the second group have to be selected according to their capability to prepare the athlete's body to carry out the exercises of the first group and to increase their training effect.

WHAT EXERCISES ARE INCLUDED IN THE SECOND GROUP?

Usually, these exercises are referred to as the means of General Physical (Strength) Preparation. This is not a right definition of them. The general preparation training means do not have a specific task, they have an over-all purpose: to develop the athlete's organism in order to give it a basic preparation for any kind of specific activity (or for a large list of specific activities). Instead, the SST exercises of the 2nd group have to assure the preliminary preparation to effectively carry out the first group exercises, which are highly specific. So, it could be more correct to refer these exercises to as *preliminary SST exercises*.
These means are usually aimed at increasing the level of maximal strength of the primary large muscle groups involved in competition exercise; they are fundamental for the subsequent increase in working effect of the main force producing movements of competition exercise.
The main criteria for selecting the preliminary SST exercises, therefore, is their capacity to enforce the working mechanisms of the body (above all, the main muscle synergies) involved in the execution of highly specific exercises of the first group.
The muscle work regime in the preliminary SST exercises may differ from competition exercises.
For example: if the athlete needs to increase the power output of his legs ground contact during competition sprinting or jumping, he needs to increase the level of maximal explosive force effort of similar movements using highly specific explosive strength exercises (jumps). Before the use of these highly specific explosive strength exercises it needs to enforce the main muscle synergies which assure improvement in the capacity to oppose the force of gravity: barbell squat, standing calf rise and in specific case, also Seated Calf Raise. These preliminary exercises are aimed at increasing the maximal strength; they should be executed slowly with high overload ranging from 80% to 93% 1RM. In order to safety execute these exercises with high overload (see - Maximal Effort Method), it needs to carry out them starting from a lower load and gradually increase it (see - Repeat-Serial Method).
Furthermore, the range of movements in preliminary SST exercises may differ from competition exercises. For example, in isometric training, to increase the maximal strength produced in a specific joint angle, the force-efforts must be performed with the same joint angle. However, it is also important to consider that: the more 'open' the working joint angle is, the higher the maximal force-effort level is produced, but performing force-efforts with a more 'closed' joint

angle assures an increase in force-effort maximal strength across almost every angle of this joint (V.Zatsiorsky, L.Raitzin, 1974).
This information about isometric training is useful when dynamic strength exercises are used with heavy overload. To increase the force-effort level of maximal strength in a more 'open' joint angle, it is, therefore, necessary to use heavier overloads. The magnitude of these overloads must be heavier than those required to increase the maximal strength level in force-efforts with a more 'closed' joint angle. These points must be considered when selecting overload exercises: the same exercise, carried out with a different range of movement, may be used for different training purposes.
For example, the following problem often arises during coaching discussions:

IS IT BETTER TO USE A BARBELL SQUAT AS A FULL SQUAT OR HALF SQUAT?
This problem does not arise if the full squat and the half squat are considered to be two different exercises; both are useful, but for different purposes. The heavy weight barbell squat with the complete closing of the knee-angle (full squat), can be used as preliminary exercise; it is effective for enforcing the 'anti-gravitational' muscles of the body.
The barbell squat, executed with less leg flexion, (the half squat or the flexing of the legs until a desired knee angle is reached), can be used as a high specific training mean aimed at increasing the maximal strength effort in the main force producing movements of competition exercise. Yet, in this exercise, the athlete should use heavier overload weights compared to those used in the full squat.
The full squat, therefore, is an optimal exercise for preparing the athlete for the half squat:
1) first, because the use of the heavy weighted full squat assures an increase in the maximal strength of the muscle synergies, involved in the execution of the half squat as well;
2) second, because the use of the full squat is less harmful to the body (assuming the athlete possesses the required joint mobility to safely perform the exercise).

Furthermore, there is another problem that often arises during coaching discussions:

SHOULD, OLYMPIC WEIGHTLIFTING EXERCISES (SNATCH, CLEAN AND JERK, PUSH JERK, POWER CLEAN, ETC.) BE USED AS SST MEANS FOR THE PREPARATION OF OTHER SPORTS DISCIPLINES?
These exercises are highly specific training means for Olympic weightlifters but, if some of them correspond to the motor structure of competition exercise of other sports discipline, then these exercises could be used as highly specific SST means. Otherwise, they may be used for general physical (strength) preparation: they are very effective exercises to develop the body and to improve practical experience in working with weights.