

Evolution of Improvement in the System of Periodization

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Adaptaion

- Any change in our body is connected to our ability to adapt.
- The input affects the output: any training exercise causes change in our body generally and also in specific muscles.
- In training sessions, improvement in results will continue as long as the organism continues to adapt.
- The maximum adaptation coincides with a peak in results.
- If we want to continue to improve results we have to provide a new set of exercises to which our body can adapt. We have to change to different effective exercises, change the method of training, and change to volume and intensity of training.
- What is good for the beginners is not effective for high level athletes.

Training Session

- All exercises can be categorized as general, general-specific, and specific.

Volume and Intensity of Training

- As an athlete develops you change not only the volume and intensity of training but the proportion between the two.
- Today, athletes use large volume and variable intensity in training.

Transference of Training Effect

- In most cases when doing two or more exercises we can see simultaneously positive, negative or neutral results. These facts indicate a very complicated problem. Without knowledge of this interaction the effectiveness of the training process will be random. Positive transference can be achieved by throwing hammers of different weights and lengths, throwing different implements, and by performing lifts that mimic throwing techniques. But even these exercises are not infallible and may not produce desired effects.

- This can be explained by the very narrow margin of specific adaptation. By certain exercises we can improve power and speed but at the same time technique will suffer.
- By power training, the beginner can easily improve speed. With the high level athlete, however, this connection disappears.
- The higher the level of the athlete the harder it is to get the transference effect from training.
- What increases results today may, in the future, produce negative or neutral results.

Individualization of the Training

All athletes have different temperaments:
(or a combination of these)

I	Choleric
II	Sanguine
III	Phlegmatic
IV	Melancholic

People of these temperaments differ in their ability to work, activity level, mental agility.

Different types of athletes:

- I Easily learns technique but habits are not stable.
- II Easily learns and retains habits.
- III Slowly learns and retains habits.
- IV Slowly learns but doesn't retain habits

For each of these groups the coach must develop a specific approach to training. We have to take into account height, weight, etc. (Example: Because athletes of the same coach have different size and body proportions, each will do the same technique slightly differently).

Role of Variable Intensity Training and Its Order

- Training loads of different intensity have variable influences on the learning process and development of technique, the continuing development of speed and power, and the speed of the recuperation process.
- CNS: weak intensity training produces a weak radiation process in the brain, maximum intensity training produces a strong effect on the nervous system, medium intensity training produces a good balance between excitation and suppression (a concentrated effect). Weak radiation unlocks excitation in CNS. Thus weak intensity training is useful at the beginning of practices or when CNS is stressed after intensive heavy training and results drop.
- Therefore training and perfection of throwing techniques can be attained by training of any intensity.

- Development of power and speed will be more effective when different intensities are alternated.
- Weak and medium intensity training are good for recuperation process (max. is not).
- The order of the training should be weak, maximum, then medium.
- To reach the highest results possible, it is necessary to systematically train with maximum intensity. However, it is possible to do this only if the athlete is in good condition.

Reciprocity Between Technical and Physical Condition

- Development of physical condition is organically linked to the development of technique. Each affects the other.
- Dr. V.M. Djachkov invented a method of simultaneous development of strength and technique.
- Disjointed method is not as effective (separate strength, power and technique training).
- Experience has shown that during a year-long training program we have to develop power, speed, and techniques simultaneously.
- The throwing of different weights + training at different intensities = technical and physical development.

Speed

- Specificity: We can have good results in sprint and be unable to execute fast turns, or vice versa.
- The transfer of training effect is possible only when the exercises mimic the movements we want to make quicker (i.e. turns).
- Even when light weights are thrown sometimes speed is not improved.
- Exercises: throwing implements of different lengths and weighs. Series of turns with implement, stick, bar, etc. For high level athletes light and heavy weights should not be too far from competition weight.

Breaking the Speed Barrier

- To break the speed barrier you need to use exercises with different time and power characteristics – more extreme than you are used to. In this case using implements that are much lighter than the competition weight is warranted.
- The systematic use of power exercises in training can develop maximum power and can improve speed – but not always. It is important to check the volume and intensity of training and length of time you are using training of specific volume and intensity.

Methods of Strength Development

- Strength development = absolute + relative power. Absolute power = test with dynamometer or kg's lifted from floor independent of body weight. Relative = absolute/mass of body. As absolute power increases but mass of body stays the same the relative power increases.
- Explosive power = power shown in short period of time.
- Simultaneously static and dynamic work is present in the throw.
- Intensity: 20 – 50% of maximum (7 – 10 rep.) - good for beginners.
70 – 100% of maximum (3-5 rep.) good for mid – high level athletes.

If we use weak intensity but high repetitions our last repetition will have the same effect as a medium or maximum intensity exercise. This phenomenon is evident in lifting and training (many easy throws, when tired enough, throws will be equivalent to medium intensity throws).

- We must remember that there is an inverse relationship between power and speed: Physiological law: $F \Rightarrow f \Rightarrow V$ (the slower the speed of the movement of throwing weight the more power an athlete can use to accelerate and vice versa.)
- The biggest effect can be obtained by optimizing the balance between speed and power. Individuality must be considered to achieve this balance.

Lifting

- Exercises should mimic your sport in characteristic, shape and specificity.
- General exercises for high level athletes often have negative effects on training results.
- Improvement of results is not dependent on the volume of power exercises but is mostly dependent on their intensity.

- It is necessary to optimize the balance between power training and specific training (throwing).
- Finding this balance will optimize the transference of training effect.

Optimum Balance

- This problem of finding of optimum balance should be resolved not at the muscular level but on the level of CNS.
- Training leaves an imprint on the CNS. It will suppress, stimulate, or have no effect (indifferent).
- Processes of excitation or suppression in the cortex of the brain are very complicated. Scientist used to believe that all impulses from muscles reach the brain but more recent studies have shown that there is a selection and blocking process that takes place in the CNS. Some impulses reach the brain others are blocked at the level of the spine.
- This knowledge has to change our attitude about the training process. Each of us has a limit to the amount of information we can learn and adapt to, or assimilate.

Conclusions

- We need to continue researching how to develop effective training. It is not enough to simply increase volume and intensity. The mechanism of transference of training effect must be understood more deeply.
- Each exercise changes the organism's condition in a specific way.
- Each athlete has her/his own rate of learning. The coach must be aware of this and not expect athletes to improve at the same rate. (*See Graph A*).

Variable Intensity Throwing

Weak	50 -80 % of max.
Medium	80 -90 % of max.
Maximum	more 90 % of max.

- Choose intensity individually.
- As maximum distance improves, weak and medium increase proportionally.
- General intensity of training is not defined only by number of maximum throws but by whole training: weak, medium, and maximum.

- Combinations of implements: light and heavy
light, heavy, and competition weight
different days different weights
variation method

Method of Controlling Progress

- Record information about each training (journal, graph).
- Record results of maximum competition weight throw each training.
- Test maximum of each exercise at least once every 3-4 weeks.
- By analyzing result dynamics you can chart improvement of development.

Peak Development

- Each athlete has a different development path.
- Each peak development has three stages:
 - 1) initial reaction to training (start \Rightarrow peak)
 - 2) peak maintenance
 - 3) loss of peak
- Exercises performed at the same volume and intensity will take the same length of time to reach a peak. If the exercises are begun at different times (i.e. some time apart) they will peak at different times. But if the exercises are begun simultaneously, all exercises will peak at the same time (*See Graph VI*). This second variant is the basis of the modern approach to periodization.
- To maintain the peak the training must be changed (15 – 20 % of the exercises).

Periodization Modalities

The old style of periodization had three basic periods: General preparation, Specific preparation, and Competition period (*See Figure I*). This approach was developed by L.P. Matviev. You can see in *Graph II* an example of throwing training using this method of periodization. *Graph III* is an example of how L.P. Matviev's periodization was adapted to produce a peak twice per year. This style of training was not individualized, all athletes followed the same idea. *Graph IV A, B, C* show different variation of the same form of periodization.

Graph V is an example of the new type of periodization. This example is the training program of an athlete who takes 2 month to peak. In this program the athlete begins all exercises used in special complex training (SCT) at the same time (*Graph VI*). Once the peak is reached, he/she begins all new exercises for SCT simultaneously (a new complex). Each complex includes throwing and lifting exercises. The same order of exercises is maintained through all the period. As the athlete's organism adapts to the volume and intensity, each is increased. Each training must include maximum throws with the competition weight. When a new program is begun all exercises should be changed except that the athlete continues to throw the competition-weighted implement. As previously stated, during peak maintenance (PM) 15 – 20 % of the exercises are changed. Each period of PM lasts about 2 weeks then an additional 15 – 20 % of the exercises must be changed if the peak is to be maintained longer. For each athlete the length of the SCT and PM is different and must be calculated individually.

NOTE: One problem with traditional periodization has been that athletes use the same exercises for a long period of time. Thus, the brain does not have the advantage of receiving new stimuli on a regular basis. With the new style of periodization, the athlete is using a set of exercises for 2 – 4 months. When the complex changes the brain forgets these exercises and they can again be used and will be very effective.

The more exercises included in the SCT the longer the period and maintenance of peak.

In throwing, this type of periodization of sport training was practically and scientifically grounded by Dr. A.P. Bondarchuk. Athletes who have used this method of periodization are: A. Bondarchuk, U. Sedih, B. Zaitchouk, S. Litvinov, V. Broomel (high jump)... and many more.

Prognosis (Classification) of Young Hammer Throwers' Results Growth

Results of Throwing									
Age	11	12	13	14	15	16	17-18	24-26	Height(cm)
Weight	1.5-2	1.5-2-3	2-3-4	3-4-5	4-5-6	5-6-7.3	6-7.3-8	7.3	Weight(kg)
Incappable	32-28	37-32.5-27	38-32-28	37-32-28	39-34.5-31.5	39-36-32	40.5-36-33	47	<u>160-170</u> <u>75-80</u>
Normal	37.5-32.5	44-38-32	44-37-32	45-39-34.5	45-39-36	44-40.5-36	53-47-45.5	54.5	<u>165-175</u> <u>80-85</u>
Capable	44-38	50.5-44-37	53.5-45-39	51-45-39	50-44-40.5	58-53-47	61.5-54.5-50	61.5	<u>170-180</u> <u>85</u>
Very Capable	50.5-44	61.5-53.5-45	61.5-51-45	58-50-44	66-58-53	67-61.5-54	69-61.5-57	67	<u>175-185</u> <u>85-90</u>
Talented	61.5-53.5	70-61.5-51	69-58-50	75-66-58	76.5-67-61.5	75.5-69-61.5	71.5-67-62	76.5	<u>180-190</u> <u>95-100</u>
Genius	70-61.5	79-69-58	90-75-66	87.5-76.5-67	86-75.5-69	82.5-75.5-67	86=76.5-71	>85	<u>165-175</u> <u>80-85</u>

Notice:

The table is suitable for athletes capable to throw from 3 to 4 turns.

This table can help you:

- to evaluate the abilities of athletes.
- to forecast athlete's improvements for 10-15 years.
- to plan trainings for current and next years.

Table of Options of Specific Hammers (Normal Length) in kg

#	A	B	C	D	E
1	50	52	54	56	58
2	52	54	56	58	60
3	54	56	58	50	61.5
4	56	58	50	61.5	64
5	58	<u>60</u>	61.5	64	<u>66</u>
6	60	61.5	64	66	68
7	61.5	64	66	68	70
8	64	66	68	70	72.5
9	66	68	70	72.5	75
10	68	70	72.5	75	77.5
11	70	72.5	75	77.5	80
12	72.5	75	77.5	80	80.5
13	75	77.5	80	80.5	85

m (heavy)	8.25	8.00	7.75	7.50	Target
m (normal)	7.26	7.26	7.26	7.26	
m (light)	6.25	6.50	6.75	7.00	

Notice:

Columns A, B, C, D – Initial results

Column E – Target results

Numbers Beneath – Training weights