Block Periodization in Sport Training: Scientific Concept and Implementation

Vladimir B. Issurin, Ph.D., Professor
Plan

• Traditional theory – criticism and restrictions

• Alternative approach: basics and outcomes

• Biological background and conclusions

Traditional theory – scope and criticism
Classic version of annual periodization (Matveyev, 1964 et al.)
Annual performance trends of great athletes

Sergei Bubka: Performance trend in season 1991

Source: Suslov, 2003
Marion Jones: Performance trend in season 1998

Source: Suslov, 2003

Typical multi-peak preparation of high-performance canoe-kayak paddlers

<table>
<thead>
<tr>
<th>Main Competitions</th>
<th>International Competitions</th>
<th>National Competitions</th>
<th>Tests &amp; Trials Competitions</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic trials</td>
<td>Winter Cup</td>
<td>National Cup</td>
<td>National Selection</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>National Cup</td>
<td></td>
<td>National Cup</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>World Cup Series</td>
<td></td>
<td>World Championship</td>
<td>12</td>
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</tbody>
</table>

Peak performances
Periodization charts in team sports

Presentation of Annual Chart in Team Sports
(based on Baker, 1998; Gamble, 2006)

Traditional Model – Typical Changes

<table>
<thead>
<tr>
<th></th>
<th>Pre-Season</th>
<th>Mid-Season</th>
<th>End-Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO$_{2\text{max}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle mass</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>AnT</td>
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<td></td>
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</tbody>
</table>

**Question**

• Should many abilities be trained at the same time?
Facts:

- Simultaneous development of many abilities decreases effectiveness of training

- Body cannot simultaneously adapt to many training stimuli

Past and Present in High-Performance Sport
General volumes of annual preparation

<table>
<thead>
<tr>
<th>Sport</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gymnastics-R</td>
<td></td>
</tr>
<tr>
<td>Running-MD</td>
<td></td>
</tr>
<tr>
<td>Fencing</td>
<td></td>
</tr>
<tr>
<td>Wrestling</td>
<td></td>
</tr>
<tr>
<td>Volleyball</td>
<td></td>
</tr>
<tr>
<td>Synchro.Swimming</td>
<td></td>
</tr>
<tr>
<td>Rowing</td>
<td></td>
</tr>
<tr>
<td>Kayaking</td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td></td>
</tr>
</tbody>
</table>

Total number of competition days per year

<table>
<thead>
<tr>
<th>Sport</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycling-Road</td>
<td></td>
</tr>
<tr>
<td>Running-MD</td>
<td></td>
</tr>
<tr>
<td>Fencing</td>
<td></td>
</tr>
<tr>
<td>Wrestling</td>
<td></td>
</tr>
<tr>
<td>Judo</td>
<td></td>
</tr>
<tr>
<td>Sailing</td>
<td></td>
</tr>
<tr>
<td>Rowing</td>
<td></td>
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<tr>
<td>Kayaking</td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td></td>
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</tbody>
</table>
Annual volumes of exercises in endurance sports (thousands km)

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Swimming</td>
<td>2.5-3.5</td>
<td>2.0-2.5</td>
</tr>
<tr>
<td>Kayaking</td>
<td>5.5-6.3</td>
<td>4.5-5.3</td>
</tr>
<tr>
<td>Rowing</td>
<td>6.3-7.3</td>
<td>5.5-6.5</td>
</tr>
<tr>
<td>Cycling-R</td>
<td>35-45</td>
<td>30-35</td>
</tr>
</tbody>
</table>

Past and Present in High-Performance Training

<table>
<thead>
<tr>
<th></th>
<th>Past</th>
<th>Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitions</td>
<td>less</td>
<td>more</td>
</tr>
<tr>
<td>Total workload</td>
<td>more</td>
<td>less</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>liberal</td>
<td>hard limitation</td>
</tr>
<tr>
<td>Development</td>
<td>mainly</td>
<td>mainly</td>
</tr>
<tr>
<td></td>
<td>simultaneous</td>
<td>consecutive</td>
</tr>
</tbody>
</table>
Is contemporary coaching more efficient?

definitely
YES

Basic limitations of traditional model

Low stimulation producing by “mixed” training
Conflicting physiological responses
Excessive fatigue accumulation
Inability to take part in many competitions
Alternative approach:
blocks and stages

Terminology

**Block** – training cycle of highly concentrated specialized workloads
Earliest attempts to implement Block Periodized Training

Anatoli Bondarchuk, track and field, hammer throwing

Block Periodized system that includes: developmental mesocycle, competitive mesocycle, restoration mesocycle; duration of training stage – 9-10 weeks

Preparation outcomes - gold-, silver-, and bronze-medals attained at the 1988 Olympic Games

Publication: Bondarchuk, 1986, 1988
Gennadi Touretski, swimming

Block Periodized system that includes: general, specific, and competitive mesocycles; duration of training stage – 6-10 weeks

Preparation outcomes – numerous gold medals of Alexander Popov and Michael Klim attained at the Olympic Games and World Championships

Igor Koshkin
Swimming

Block Periodized system that includes: speed/technique, strength, aerobic conditioning, taper and competition, restoration; duration of training stage – 10 weeks

Preparation outcomes – three gold medals of Vladimir Salnikov; numerous medals attained by other swimmers in European and World Championships

Adopted from Gullstrand, 2001
Vladimir Issurin & Vassili Kaverin, Canoe-Kayak

Block Periodized system that includes: accumulation, transformation and realization mesocycles; duration of training stage – 6-10 weeks

Preparation outcomes – 3 gold and 3 silver medals of USSR National Team at the Seoul Olympic Games; 8 and 9 gold medals at World Championships of 1989, 1990

Publication: Issurin, Kaverin, 1985,1989

The principal methodic demands to BP training were almost identical:

1) mesocycles-blocks where focused on minimal number of targets;
2) the total number of proposed blocks is relatively small;
3) the single mesocycle-block’s duration ranges within two-fore weeks;
4) joining of single mesocycles forms training stage;
5) a number of training stages forms annual cycle
### Block Periodization vs. Traditional Theory

<table>
<thead>
<tr>
<th>TT</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Simultaneous</strong> development of motor abilities and skills</td>
<td><strong>Consecutive</strong> development of motor abilities and skills</td>
</tr>
<tr>
<td><strong>Medium (low)</strong> concentration of training loads</td>
<td><strong>High</strong> concentration of training loads</td>
</tr>
<tr>
<td>Focus – training <strong>periods</strong></td>
<td>Focus – <strong>blocks-mesocycles</strong></td>
</tr>
<tr>
<td>Background – cumulative training effect</td>
<td>Background – cumulative and <strong>residual</strong> training effect</td>
</tr>
</tbody>
</table>

#### Diagram:

**A** - Traditional Approach

**B** - Non-Traditional Approach

- **A**: Traditional approach for annual cycle training
- **B**: Alternative schemes of annual cycle training
Basic principles of BP

- High concentration of the training workloads
- Minimal number of abilities-targets within single block
- Consecutive development of many abilities
- Compilation and use of specialized mesocycles-blocks

Important

The cornerstones of Block Periodization

- high training loads’ concentration
- residual training effects
- consecutive development
- training blocks taxonomy
- peaking
High training loads’ concentration

**Facts:**

In qualified athletes highly concentrated training loads only provide sufficient training stimuli.

In elite athletes 60-70% of total training time is devoted to minimal number of targeted abilities.
Gain and improvement rate of the maximal strength in elite female kayakers

Residual training effects
Prof. James Counsilman – great coach and scientist
**Terminology**

**Residual training effect:**
- retention of changes in the body state and motor abilities after the cessation of training beyond certain time period

**Important**

**Force decrease after strength training cessation**

- Large force decrease
- Small force decrease

Adapted from Mujika & Padilla, 2000
VO$_{2\text{max}}$ decrease after endurance training cessation

Adapted from Allen a.o., 1989; Coyle a.o., 1985; Pivarnik, 1986; Wibom a.o., 1992

Residual training effects

- Aerobic endurance
- Maximal strength
- Anaerobic endurance
- Strength endurance
- Maximal speed

Days number
Consecutive development

Sequencing of training targets

Training stage

Blocks-mesocycles

Competition

Basic abilities

Sport-specific abilities

Tapering
# Training blocks taxonomy

<table>
<thead>
<tr>
<th>Type</th>
<th>Abilities-Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulation</td>
<td>Basic motor and technical abilities: aerobic endurance, muscular strength, basic coordination...</td>
</tr>
</tbody>
</table>
### Taxonomy of blocks-mesocycles

<table>
<thead>
<tr>
<th>Type</th>
<th>Abilities-Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmutation</strong></td>
<td>Specific motor and technical abilities:</td>
</tr>
<tr>
<td></td>
<td>anaerobic endurance,</td>
</tr>
<tr>
<td></td>
<td>strength endurance,</td>
</tr>
<tr>
<td></td>
<td>proper technique…</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Abilities-Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Realization</strong></td>
<td>Tapering:</td>
</tr>
<tr>
<td></td>
<td>full restoration,</td>
</tr>
<tr>
<td></td>
<td>maximal speed and quickness,</td>
</tr>
<tr>
<td></td>
<td>event specific readiness</td>
</tr>
</tbody>
</table>
Peaking - obtaining the best athletic conditions at a particular moment
**Superposition of Residual Training Effects – Timing**

- **Accumulation**
- **Transmutation**
- **Realization**

**Blocks-mesocycles**

- **Competition**
  - 8-14 days
  - 12-25 days

**Residuals**

- 12-30 days

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**Annual Preparation Chart – Block Approach**

- **Winter Trials**
- **Spring Trials**
- **Trials**
- **Targeted competitions**

**Stages**

- **Stage I**
- **Stage II**
- **Stage III**
- **Stage IV**
- **Stage V**

**Preparation period**

**Competition period**
The latest outcomes of the BP studies

The 2006/2007 season was scheduled for macrocycle Traditional model 20-week (October-March) and Two ATR until the World Championship in Duisburg in August. It was the first time in the Spanish canoeing executing a program with ATR and I had serious problems to convince the technical direction and management of sport to achieve the macrocycle ATR. The results in Duisburg 2007 were not spectacular but I used to learn a lot about the Block Periodization and convince my Head coaches to program in the 2007/2008 season five ATR until the Olympic Games.

Carlos Perez and Saul Craviotto had no qualification for the Olympic Games and we had to get it in the European Championship in Milan. They had not ever done K-2 until January 2008. In May they were 2º place in Europe Championship in Milan and in August were Olympic Champions. The Block Periodization had been helpful, two peaks so high in so short time.

Jesus G. Pallares
National Canoeing Coach
Performance changes in world-class kayakers following two different training periodization models

Jesús García-Pallarés - Miguel García-Fernández - Luis Sánchez-Medina - Mikel Irurzun

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Traditional Periodization (TP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>A&lt;sub&gt;TP&lt;/sub&gt;</td>
</tr>
<tr>
<td>Main Target</td>
<td>VT2</td>
</tr>
<tr>
<td>Week</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
</tr>
<tr>
<td>Test</td>
<td>T&lt;sub&gt;TPA&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Cycle</th>
<th>Block Periodization (BP)</th>
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<td>1 2 3 4 5 6 7 8 9 10 11 12 13</td>
</tr>
<tr>
<td>Test</td>
<td>T&lt;sub&gt;BPa&lt;/sub&gt;</td>
</tr>
</tbody>
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Saul Craviotto and Carlos Perez (ESP) - Olympic Champions
By Brendan Gonring  Published: September 10

This program is based on the concepts outlined in Dr. Vladimir Issurin’s, *Block Periodization: A Breakthrough in Sports Training*. This isn’t meant to be a program directed toward all powerlifters of all levels or qualifications, nor is it meant to provide the reader with all of the foundations for developing a block periodization plan for powerlifting or any other sport.

Results and closing thoughts

The author achieved excellent results upon completion of this program. At the bench press and deadlift contest, the author improved his competition personal records in the bench press and deadlift by 40 and 70 lbs, respectively, narrowly missing a 70-lb personal record in the bench press. The author’s training partner also had excellent results on the program as well, achieving a 60-lb personal record in the bench press as well as his highest deadlift since a serious hamstring injury.
Conclusion

It is the opinion of the author that the block periodization approach has great potential for training toward achievement of sports mastery in the sport of powerlifting.

It is suggested that interested readers examine Dr. Issurin’s text upon which this program was based for a much further in-depth discussion of the principles of block periodization and its application to sports training.

Biological background of Block Periodized Training
Homeostatic regulation is a predominant mechanism for developing basic sport abilities like cardiorespiratory fitness, general neuro-muscular coordination, and morphological and organic adjustment of the musculoskeletal system. Therefore, homeostatic regulation serves as a dominant mechanism of adaptation to training in the early stages of long-term athletic preparation and for developing of basic motor and technical abilities in high-performance athletes.

In terms of BP these cycles are specified as accumulation mesocycle-blocks.
"Another major pathway involved in the stress mechanism is carried through the catecholamines liberated under the influence of an acetylcholine discharge, at autonomic nerve endings and in the adrenal medulla”

The Nature of Stress
by Hans Selye
The strong training stimuli elicited by workloads of high intensity mobilize the athlete’s energy resources in amounts that exceed the metabolic level necessary for homeostatic response. These increased demands trigger off profound endocrine responses, i.e., the secretion of stress hormones. Thus, highly intensive anaerobic glycolitic exercises produce a pronounced catecholamine response (Viru, 1985, 1995), and the rapid secretion of cortisol, corticotropin and β-endorphin (Lehman, Keul, 1981).

In terms of BP this training specified as transmutation mesocycle-blocks.

Preparation that entails the use of both types of training concurrently demands energy needs that surpassing the limits of homeostatic regulation. Correspondingly, stress reactions become stronger. This more strained metabolic and hormonal body environment suppresses homeostatic responses and has a deleterious effect on workloads intended to develop basic athletic abilities. Such conflicting responses, which are typical of mixed training among high-performance athletes, lead to a decline in general aerobic abilities, a reduction in muscle strength and cases of overtraining.

BP model allows to avoid such conflicting physiological responses and exploits the most appropriate mode of biological adaptation.
How to accomplish these knowledge?
Tuesday, December 2, 2008
Cardio and Block Periodization
... I also have finally gotten around to reading Dr. Issurin's book on Block Periodization. ...

I utilized things I learned from Dr. Issurin with a Shot/Discuss athlete last season and he took 1st in state in the disc, I believe 4th in shot, and got a scholarship to throw for Colorado State University. I am looking forward to what will happen once I more fully understand his theories and principals.

POSTED BY COACH MYERS AT 10:45 AM
LABELS: BLOCK PERIODIZATION, CARDIO, DR. ISSURIN
Never before the coaches receive such practical and useful information on training methodology and enhancement of athletic mastery. Using this knowledge the coaches and athletes will be able to reach new heights and greater success. There is no science fiction – everything is absolutely realistic.

Ivan Klementieiev
Olympic champion,
seven-time world champion,
member of national parliament of Latvia

I use this opportunity to express my appreciation of methodological recommendations of Prof. Issurin that have assisted me greatly in my work. Prof. Issurin belongs to category of scientists, who know and understand the needs of coaches and his work has expanded our knowledge and enriched our coaching abilities allowing us to strive and reach better results.

Oreste Perri
Two-time world champion, personal coach of a number of Olympic and World champions. Head coach of Italian canoe-kayak national team.
Dr. Issurin provides an innovative new take on periodization; the most effective method for preparing athletes for competition. In their pursuit of athletic excellence, this in-depth work will be an important resource for scientists, athletes, and coaches alike.

Chris Carmichael, Personal Coach to 7-Time Tour de France Champion Lance Armstrong, USA

Conclusions

1. Block Periodization as an alternative training approach is worthy for learning and implementation in the preparation of high-performance athletes
2. Basics of Block Periodization are formed by general principles of BP (1), taxonomy of mesocycles-blocks (2), and guidelines for compiling annual cycle (3).

3. Biological Background of Block Periodization is closely connected with two fundamental contributors of human adaptation:
   - classic theory of homeostasis, and
   - mechanisms of stress adaptation.
Thank you for your attention