Principles of Monitoring
Link Between Planning and Preparedness

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Why Monitor Training?

Ya’ gotta have dots to connect them

"You can’t connect the dots looking forward; you can only connect them looking backwards. So you have to trust that the dots will somehow connect in your future."

Steve Jobs
1955-2011

Connecting the Dots

Why do coaches and athletes resist connecting the dots?

I’M TOO SMART
FOR THIS S%#T
Training is Complicated

- Evidence Based Coaching
  - Requires ongoing assessment
  - Why would anyone choose ignorance over knowledge?
  - Coaches are in the best position to know.
    - But, information is often hidden, subtle, and fragile.

Count the Number of Fs

Finished files are the result of years of scientific study combined with the experience of years...

Answer: 6

Count the Number of Fs

- Show of hands...
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8

Why Monitor?

- Training is a process
  - to characterize the process.
- Long-term development
- Training is not entirely predictable.
  - Mistakes are expensive
- Avoid overtraining
- Avoid injury

Count the Passes of Players Wearing White

If you’ve already seen this please stay quiet.
### Why Monitor?

Is skiing the world's most dangerous sport?

#### Severity

<table>
<thead>
<tr>
<th>All Injuries (n=705)</th>
<th>Severe Injuries &gt;28 days (n=179)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity</td>
<td>Injuries in percentage</td>
</tr>
</tbody>
</table>

#### 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>Cycling-Road</th>
<th>Running-MD</th>
<th>Fencing</th>
<th>Wrestling</th>
<th>Judo</th>
<th>Sailing</th>
<th>Rowing</th>
<th>Kayaking</th>
<th>Swimming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

V. Issurin, 2007

#### Classic version of annual periodization

(adapted from Portman, 1986)
Transferability – Men's Triple Jump

How should we cope with these demands?

- It's not a problem (the consensus-france)...
- Anticipate that athletes will only last one or a few Olympiads and plan for it.
- JT approach – heavy emphasis on TID(youngsters) and natural attrition.
- Emphasize optimizing the final year of the quad.
- Try to extend the career of veteran athletes (paradigm shift).
- Keep athletes going at a world level longer.
- Prepare athletes more patiently and develop better training methods (and understanding) for mature athletes.
- Emphasize long-term development with junior and "near" world level athletes.
- Develop better understanding and training for young athletes to keep them developing on a longer and higher preparation arc.
- Develop multiple teams for those with deep talent.
- Plan competitions more carefully.
- Recycle Athletes and Talent ID in College for late maturing sports.

Monitoring Training

- What is worth monitoring?
  - Dose – Response relationship
    - What are skiing "doses?"
  - Training diaries
  - Regular tests
  - Individuals vs Groups/Teams
  - Others

What is worth monitoring?

- The search for markers...
  - Lactate, heart rate variability, ammonia, glutamine, morning heart rate, immune system, POMs, etc.
- Why univariate approaches haven't worked.
  - Anomaly detection
  - The data are actually in the noise...
- What are we really trying to find out?
  - Departures from stability
  - Ideographic vs nomothetic approaches
  - Group vs Single-Subject Designs
- Are you willing to devote the time and energy?

Response to Stress – Characteristic but Idiosyncratic

- "Although researchers have suggested an impressive array of sophisticated tests to detect overtraining, the best measures continue to be the simplest changes in performance and self-rated perception of fatigue and well-being.
- "...A training diary which records and assesses all of these elements in a systematic fashion would seem essential."

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What is training supposed to look like?

• If you’re doing the right things, how would you know?

Training Models
Lots of ideas...

• Sleamaker
• Verkhoshansky
• Matveyev
• Zatsiorsky
• Nadori
• Bompa
• Bondarchuk
• Counsilman

Training Theory - Models

• At least a dozen training models
  – A “big picture” approach to training management
  – Control of volume (how much) and intensity (how hard). And lots of other stuff.
  – Here are two:

General Adaptation Syndrome (GAS)
Training Adaptation Syndrome (TAS)

What are the typical patterns of adaptation to training?

Optimization of the Training Load

How do you translate from GAS/TAS to Training?

Fitness and Fatigue

Block Periodization

Paradigm Shift

- Do not train concurrently; train in sequence
- Follow the sequence: 
  basic abilities → more specific abilities → tapering → Competition

Managing Training Load
Long-Term for Optimal Performance
Superposition of Residual Training Effects – Timing

Blocks-mesocycles

Accumulation

Transmutation

Realization

N-14 days

Residuals

12-30 days

12-25 days

Annual Preparation Chart – Block Approach

Preparation period

Competition period

Water Cup

Spring Cup

International competition

1st stage

2nd stage

3rd stage

4th stage

12-30 days

12-25 days

8-14 days

Know the athlete

See their future...

Know your training...

- Training Design
- Monitoring
- Transferability of Training Tasks to Performance
- The Garden of Performance
  - Career Advancement and Development Plans
    - Quad Plans
    - Annual Plans
    - Mesocycle (monthly) plans
    - Microcycle (weekly) plans
    - Training lesson plans
  - The roles of volume, intensity, density, frequency, recovery/adaptation.
What about process?

- **Homeostasis**
  - Set point regulation
  - Narrow range of change
  - Survival importance
  - Reactive

- **Allostasis**
  - Internal viability through bodily change
  - Feedforward
  - Predictive

- **Allostatic State**
  - Chronic over-activation, beyond set points

- **Allostatic Overload**
  - Pathological overstimulation

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**Track and Field Examples**

**Men’s Shot Put**

- Distance vs Year
- Regression: $r = 0.961888$
- Intercept: $-163.982$
- Slope: $0.093285$
- SEE: $0.935621$

**Women’s Shot Put**

- Distance vs Year
- Regression: $r = 0.76428$
- Intercept: $-197.28$
- Slope: $0.10962$
- SEE: $1.71702$

**Men’s Speed Skating 5000M**

- Time vs Year
- Regression: $r = -0.74263$
- Intercept: $3919.852$
- Slope: $-1.74904$
- SEE: $11.73269$

**Women’s Speed Skating 5000M**

- Time vs Year
- Regression: $r = -0.96668$
- Intercept: $264.476$
- Slope: $0.11425$
- SEE: $0.736479$

**Winter Sports: Different Pattern**

**Men’s Speed Skating 5000M**

- Time vs Year
- Regression: $r = 0.961888$
- Intercept: $204.475$
- Slope: $0.71205$
- SEE: $0.115979$

**Women’s Speed Skating 5000M**

- Time vs Year
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Monitoring Isometric Breaking Strength and Body Composition

Isometric knee extension breaking strength
Sum of Four Skinfolds

University of Utah
Women’s Gymnastics Team (2nd NCAA)

1. Weekly tests
2. One academic year
3. Entire team


Skinfold Sums

Four sites
Sum the mm
Reflective of Change in body composition


Bosco Test - Average Power Trends
Women’s Gymnastics - Sydney 2000

Response: Weightlifting (Female)
Daily Training – National Team - USOC

RESTQ - Aerials

Response: Force-Time Curves

Weightlifting

Weekly Static Vertical Jumps

USA Weightlifting National Team - USOC

Local Monitoring

- Monitoring Local Dose/Response is also important
- Dose
  - Runs counts
  - Turns counts
  - Attempted vs completed
  - Altitude change
  - Compliance with drills
- Response
Once they're serious athletes...

- How much/long should they improve (Bondarchuk, 2007)
  - 20 cycles = Olympic level
  - 15 cycles = high national, low international level
  - 10 cycles = national level
  - <10 cycles = developing or no talent

Weightlifting (M/W)
Bilaterally symmetrical
Note: Quads>Back

Figure Skating

Track Cycling

NOT bilaterally Symmetrical!!!

Questions?