Considerations in Regards to Triphasic Adaptation Responses

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My job as a coach? Not SC

- I questioned myself on what measures a good coach.

- Months of thought.

- This was final conclusion
My job as a coach? Not SC

- Did I make an impact on the life of my athlete.
- Did I show I care, did I leave an example of servant leader.
- Will the athletes tell me I made an impact on them. Office
“Biochemical Adaptations”

- The changes to the multiple functioning systems within the organism to improve the ability to maintain internal milieu
  - Multiple systems involved
  - Goal is to maintain homeostasis through changing environments

- What it is and how we look at it in athletics
  - How adaptations occur in the organism
    - Improvements in performance due to long-term, cumulative changes
    - Training completed leads to these net effects
Various Specificity of Athletes

- Olympian – 5-13
- BWT – 155-175
- VJ – 16.9 – 22.6
- Pro Agility – 5.35 – 4.49
- E-10 Yard – 1.97-1.84
- E-20 Yard – 3.29-3.04
- Squat 155-235
- Bench 120-155

Mental-Soon To Be Pro – another jump.
- 4 years in program
  - Hit Limit?? – Omegawave response
- Two Top Mid Distance
- Elite High School - failed
- Sport Filters Out Personnel
- Testing, Anthropometric
Same Athlete - During Year
Multiple Training Years
Cooked!!!

- Schedule?
- Sick?
- Lack of food?
- Recovered?
- Aerobic – System??
Biochemical Adaptations to Training

- Every training session/exercise triggers an acute adaptation process
  - Body adjusts functions to corresponding level of elevated energy metabolism

- Systematic repetitions create long-term, sustainable adaptations
  - Achieved through training resulting in structural and metabolic enhancements
  - Long-term planning is crucial to ensure proper stable adaptations are created

- Nature of the chosen exercises determines long-term training adaptations
  - Specific training strategies for desired adaptations
    - Intensity and duration
      - Both determine energy systems used
Building the Base

- The Bio-energetic Views-
  - Anaerobic/Creatine Phosphate - 0-10 Seconds
  - Lactate/Glycolysis - +10 – 120 Seconds
  - Aerobic – Heart Rate – Long Duration
## Alactic Anaerobic / CP

### High Quality Ratios
- 0-10 Seconds Work
- Rest
- 2:30 – 5:00 Minutes
- Reps 6 - 8

### Work Capacity Ratios
- 0-10 Seconds Work
- Rest
- :45 – 1:30 Minutes
- Reps 8 - 16

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Lactate/Glycolysis

High Quality Ratios
- +10 – 120 Seconds Work
- Rest
- 2:30 – 5:00 Minutes
- Rest up to 8 Minutes Elite Track
- Reps 6 -8

Work Capacity Ratios
- +10 – 120 Seconds Work
- Rest
- :45 – 1:30 Minutes
- Reps 6-10

Aerobic / Oxidative

Guidelines

- Non Adaptive Stress Response – 110 – 150 Heart Rate
- Stay under Lactate Thresholds
- Aerobic is the most important

Various Protocols

- Too many to list
- Key components for Aerobic possibilities
- Intervals for aerobic work – 4 minutes max for good Quality aerobic intervals

Long Duration Protocols
Determine the Needs of Every Athlete

- Knowing each exercise causes specific adaptations, coaches must understand physiology and requirements of each competitive event or training Cycle and or method.

- Use 3 categories for simplicity – all require different parameters
  - Maximal effort – Weight lifting
    - Near-maximal recovery from every rep
    - High force output required
  - Repeat sprint effort – many team sports need to optimize this ability
    - Dependent on multiple qualities gained through training
  - Cyclic effort – distance running
    - Relies on cardiac output, aerobic ATP production and tolerance to energy metabolites
Repeat Sprint Ability

- Imperative for Most Sports – Also for training
  - Mixture of multiple sport activities
  - Requires functional systems to adapt optimally for success
    - Rapid force production
    - Energy availability and capacity
    - High recovery rate
    - Cardiac output and blood flow
    - Metabolite production and clearance
- Must train systems individually to maximize adaptations
  - Systemic and Non Specific Training – Non Maximized
Stable Adaptations

- Reflects the net cumulative training effect
  - Adaptation is specific to training executed
    - Max speed vs. conditioning example

- Potential stable adaptations
  - Muscular/CT
  - Cardiac
  - Metabolic
  - Endocrine
  - Nervous system
  - Soft tissue

- Quantitatively measured by athletic condition and top form
  - Testing to determine adaptations
Muscular/CT Adaptations

- Tissue Remodeling
  - Improved myosin-attachment
- Muscle contractile steps
- Muscle action occurs at a higher rate
- Stretch shortening cycle
- Jim Snider
Most Advanced Method

• Supra-maximal Loading- Off Season
• 120 to 100 % + Loading During Eccentric/Isometric
• Most Effective Results in Speed and Reactiveness - Results 3 to 6 weeks – Post
• Compressed Training Effect
• Not Sport Specific
• Adaptation for Time Principle
Coaching Points

RFE – Above 100% load Caused issues (SI Joint)

Front Foot – Toe Pull / Back Foot – Toe up
Breathing
Glutes
Various Aspects of Supramaximal

- Strength for powerlifting movements
- Strength for sport
- Maximal Muscle Recruitment
- Maximal Fast Twitch
- Hyperplasia of myofibrils in muscle fibers

- Increase in free creatine in muscle fibers
- Increase concentration of hydrogen ions if duration enough and or rest reduced
- Hypertrophy of myofibrils in fast muscle fibers
Cardiac Adaptations

- Foundation for all performance parameters
- Improved efficiency through training
  - Central
    - Increased stroke volume
    - Improved contraction force/velocity
  - Peripheral
    - Improved oxygen kinetics
      - Increased hemoglobin concentration
      - Increased capillary density
      - Improved $O_2$ extraction
- $VO_2$ still not perfect predictor of RSA
Cardiac Adaptations

- Foundation for all performance parameters
- Various Athlete’s
  - Resting Heart Rates 36 to 40
  - High Volume Programs 5 day a week also causes Cardiac adaptations

High Volume of Season Programs
- 4 Corners Testing – Women
Metabolic Adaptations

- Increase cellular resources due to training reduces need for increased systemic mobilization of resources during vigorous exercise
  - Body becomes “better prepared” to a stimulus
  - Homeostatic reactions may also diminish to some extent
  - Potential decrease in exercise-induced hormonal responses or avoid them altogether – Sprinter vs Marathon

- 3 Energy Systems
  - Alactic
  - Lactic/Glycolytic
  - Aerobic/Oxidative

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Senior vs Fresh-Biological Qualities
Trending Diets
Metabolic Adaptations

- Energy System Development
  - 72 Bouts of 5 Seconds Max Efforts Repeated Sprints.
- Friday 40 to 50 Bouts of 10 Seconds – Global and Local
- Aerobic
Neural Adaptations

- Rate of force development
  - Crucial in high-velocity movements

- Two phases
  - Early – neural
    - Recruitment
      - Selective in learned skill
    - Rate coding
      - Doublet occurrence
    - Synchronization
Endocrine Adaptations

- Related to change in threshold intensity
  - Threshold intensity of exercise is shifted to a higher level
    - Need higher intensities to achieve hormonal response
  - In maximal intensity cases hormonal responses are magnified in athletes
    - Actual training-induced changes in the hormone response to exercise depend on a combination of various alterations in the organism

Acute responses more critical to tissue remodeling
Endocrine Adaptations

- Related to Supra Maximal Training
  - In Self Reported Results
  - Omega Wave Results
  - Blood Test
  - Peaking and Deload Weeks
Soft Tissue Adaptations

- Remodeling of Tissue

- Cortisol Management – 10 second sets or less

- Stronger tissues are less likely injury
Soft Tissue Adaptations

Running most effective - Forces
Strong man
Isometric Flexion
Firing Pattern

- Correct Pattern for Hip Extension
  - Glute, Hamstring, Contralateral QL

- What Changes this Pattern??
  - Bracing, Injury, and Structural Changes

Practical examples
  - Bench
  - Pulling -
New Tissue Consideration

• You should never lose sight of the ultimate goal, to add new tissue. This requires balancing the hyperplastic effect of the training against the strong tendency of the body toward catabolism. Cortisol is the body's bio-chemical agent for catabolism. Training, particularly heavy training, raises Cortisol levels. When Cortisol levels rise, new tissue is favored over old tissue. This raises the potential for a net loss of muscle tissue. This is clearly counterproductive. Wesley James
Tissue Remodeling Biochemical

• Triphasic tissue remodeling – the consideration to keep cortisol down should play a role in programming.

• After those sets possible sets rest periods are extended and sets are reduced to under 10 seconds. Cluster Training concept.
Stable Training Program

- Systematic, specific stress model
  - Block periodization – Cause Deep Adaptations
    - Residual effects

- Modified undulated training
  - Specific training per day

- Specific muscle action training
  - Eccentric and Isometric stronger
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<th>Monday</th>
<th>Wednesday</th>
<th>Friday</th>
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<tr>
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<td>20-30</td>
<td>70% Iso - 50% OC</td>
<td>70% Iso - 50% OC</td>
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<td>90% Iso - 70% OC</td>
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<td>80% Plus</td>
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<td>50%-25%</td>
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Weekly State of Organism

- Self Report Hormones 120
- Lack of Stress - Functional
- Not One Model Training
- Management of Stress
- Vegas Trip
- Triphasic – 6 Weeks?
Real In-Season Maladaptation

1 Week
M W

2 Week
M W

3 Week
M W

4 Week
M W

5 Week
M W

12 Day Straight of Practice

DONE

2 days off
## North Stars Player Report

### vs. CHICAGO 12/1/16

<table>
<thead>
<tr>
<th></th>
<th>Player Load</th>
<th>Total PL/min</th>
<th>On-ice PL/min</th>
<th>Skating Load (%)</th>
<th>Contact Load (%)</th>
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<tr>
<td>Game</td>
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<td>2.7</td>
<td>6.8</td>
<td>144 (1:1)</td>
<td>7 (3)</td>
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<td>1st Period</td>
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<td>2.6</td>
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<td>46 (50)</td>
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<td>7.2</td>
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<td>91</td>
<td>2.5</td>
<td>6.8</td>
<td>46 (51)</td>
<td>2 (2)</td>
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### Player Load

- **Momentum Based Skating**
- **Acceleration Based Skating**

### Average Total Load

- **Total Load**: 243 ± 22
- **Skating Load**: 125 ± 16

### Game Details

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<tr>
<th>Game</th>
<th>T.O.I</th>
<th>PL</th>
<th>Total PL/min</th>
<th>On-Ice PL/min</th>
<th>Skating Load</th>
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<th>Contact</th>
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<th>High IMA</th>
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<td>199</td>
<td>2.2</td>
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<td>96</td>
<td>78</td>
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<td>8.4</td>
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<td>112</td>
<td>41</td>
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<td>6.3</td>
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<td>120</td>
<td>24</td>
<td>7</td>
<td>1.05</td>
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### Average

- **Total PL/min**: 240
- **On-Ice PL/min**: 280
- **Skating Load**: 126
- **Momentum Skating**: 98
- **Acceleration Skating**: 28
- **Contact**: 8
- **Ocean Deficit (LT/RT)**: 1.27
- **High IMA**: 154
Positional Game Breakdown

<table>
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<th>Position</th>
<th>Period 1</th>
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<tr>
<td>92</td>
<td>87</td>
<td>72</td>
<td>F</td>
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Legend:
- Blue bars represent Player Load.
- Red line represents Player Load / min.
Weekly Game Load Affects Win/Loss

Weekly Avg. Practice Load < 900
Win % = 0.800

Weekly Avg. Practice Load > 900
Win % = 0.428
Player Profiled First Week of Season

**Accel:** 3.39 G  
**Gyro:** 400 deg/s  
**Player Load:** 2.52
Player Profiled After 2 SD Jump in High Force Stride Production

**Accel:** 2.73 G (↑20%)  
**Gyro:** 383 deg/s (↑6%)  
**Player Load:** 2.95 (↑17%)
Player Returning from High Ankle Sprain

**Rt Leg Accel:** 2.79 G  \hspace{1cm}  **Lt Leg Accel:** 1.78 G
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