Periodization for the Young Athlete: Bridging the Gap Between Training and Rehabilitation

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Don Hoover  PT, PhD, CSCS

Introduction

- The problem…..
  - To be healthy, the body needs a “sweet spot”…
  - that lies on a continuum between “enough” physical activity and “too much” physical activity
  - To _______ human performance…
  - The margin for error is much narrower for this “sweet spot”

One Solution: _______________

- Over the last 50 years, athletic preparation has progressed in scope and complexity (49,50, 67)
- Successful athletes now often train with as much forethought and planning as possible (4, 12, 20)
Understanding the Physiology of the Complex Injury: An Approach to Return to Play
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After completing this learning module, the conference attendee will have accomplished the following objectives:

Part I: A “micro” analysis of return to play

Compare and contrast the physical characteristics of the connective tissues which serve as the “building blocks” of the musculoskeletal system (e.g. bone, ligament, cartilage, tendon, muscle).
Define Wolff’s Law and apply an understanding of this concept to connective tissue biomechanics.
Describe the biomechanical properties of connective tissue and the processes which influence its remodeling.
Apply an understanding of tissue loading to both injury prevention and exercise prescription scenarios.

Part I: A “macro” analysis of return to play

Define all forms of physical activity as a disruption of homeostasis
Define periodization as the most sophisticated method available to coaches preparing athletes for competition
Describe the foundations of periodization theory such as Selye’s General Adaptation Syndrome (GAS)
Compare and contrast base concepts in periodization
Identify current limitations in practical application of periodization
Apply periodization principles to the treatment of sports injuries
Periodization

- Characterized by the dividing of the training plan into smaller, distinct phases (7)
- A means of separating the program into more manageable segments (8)

Periodization

- Represents the most method of preparation for competition (7)
- In recent decades periodization has been increasingly used at all levels of athletic preparation
- Little evidence suggests its used much in youth sports

Periodization

- A basic understanding of the periodization process to sport medicine professionals to
  - Minimize risk of injury
  - Expedite the successful return of the athlete to competition following an injury
Exercise as Disruption of Homeostasis

- Any physical activity is best described as a physiological stressor \(^{(59)}\).
- Physical activity generates a disruption within the body and all attempts by the body to regain its homeostatic state \(^{(48)}\).

Disruption of Homeostasis

- When physical activity is properly dosed in individuals who possess the physiological capacity to respond acutely, homeostasis is restored. This occurs \(^{(59)}\).
  - with repeated bouts of properly dosed physical activity
  - in individuals having the physiological capacity to respond over longer time frames

Conversely \(^{(59)}\),
- When the body’s tissues and systems are overly disrupted, disease and injuries occur, and even death happens.
Foundations of Periodization Theory

- Application to athletic preparation first emerged in the late-twentieth century (8)
- Most of the periodization theory and terminology widely used today can be traced to the work of Hans Selye (48)

Selye’s GAS

- The GAS consists of three stages, each having distinct characteristics and traits (48)
  - Stage of Reaction - the body responds nonspecifically to the disruption to homeostasis
  - Stage of Resistance - the stress is relatively mild and advantageous, and in this stage the body can adjust.
  - Stage of Exhaustion - the body cannot adjust.
    - The stress becomes chronic or the adaptation to the stressor is lost.

Christian, Selye, and the GAS

- Selye conducted much important scientific work on the non-specific responses of tissues subjected to a wide variety of physiological and psychological stresses
  - General Adaptation Syndrome (GAS) (48)
    - Basis in endocrinology
    - Describes the sequelae when the body is exposed to stressors
      - Acutely and over time

- Physiological stress is a significant byproduct of training and competition
- Periodization theory and annual training calendars thus play an important role in helping the athlete manage the various physiological and psychological stressors associated with training and competition (8)
- These principles similarly may be of great benefit when integrated into the rehabilitation of injured athletes
Foundational Training Concepts:

Basis for sport-specific development, and for therapeutic exercise prescription

Base ________ in Periodization

- The higher an athlete's competitive fitness
- The shorter duration s/he can maintain this peak
- The annual training calendar used to ensure peaking for the main competitions of the year
- Well-executed periodization plan provides heightened ability to
  - Control the peaking process
  - Minimize the risk of injury

Base Concepts in Periodization

- Intensity
- Duration
- Frequency
- Mode
- Volume
- Specificity
- Rest
- Active-Rest
Base Concepts in Periodization

- Leveling of improvement in seasoned athletes (12)
- Non-linear improvement for all athletes (36)
- Periodization timelines versus ____________ timelines (3)
- Exercise dosing miscalculations can have profoundly negative effects

The Annual Training Calendar:
A reasoned approach to stimulating and predicting performance

The Annual Training Calendar:
The major tool to overcome the body's natural resistance to improvements and work capacity (8, 20, 47)
Training variables are “cycled” so as to alter training in a calculated way
The Annual Training Calendar

- The calendar is conventionally divided into cyclic phases of training
  - Preparatory phase
  - Competitive phase
  - Transitive phase
- Macro and micro cycles
  - Shorter phases with specific training goals
  - Derived from the general objectives of the annual training plan

The Annual Training Calendar

- Consists of progressively more qualitative workouts over a given period of time
- Graded ______ needed over time to acclimate to more intense training loads

Current Challenges in Periodization:

Linking theory to practical application during training
Current Limitations in Practical Application

- **weeks are needed for advanced athletes to reach a peak** *(8)*
- Timing, sequencing, and interaction of training stimuli are crucial to triggering optimum adaptive responses
- The athlete development goals...
  - Maximize fitness & sport form
  - Minimize fatigue

Current Limitations in Practical Application

- **in the literature**
  - Individual versus team sport *(19)*
  - Linear periodization *(4, 3, 35)*
  - Non-linear or undulating periodization *(20, 41)*
  - Limited sample size and/or time frame of the typical study *(44, 14, 17, 63)*
Periodization and the treatment of sports injuries:
A connection between clinical and competitive worlds

An Evolution in Thought
- Sports Medicine literature in the 1980s and 1990s (66, 60)
- Few sources addressed periodization
- Initial emphasis on raising physical limitations of injured tissue
- Literature (15)
- Still interest in raising capacity of injured tissues
- Greater appreciation of
  - Poor movement patterns during landing, etc
  - Human movement system

An Evolution in Thought
- Continued refinement of treatment protocols
- Greater reliance upon recovery vs tissue regeneration timelines
- Broader monitoring of markers
  - Aerobic and anaerobic metabolism
  - Neurological
  - Endocrine
  - Immune

Take Home Messages
- All tend to identify that youth sport participants are overdoing it
- But the experts are and thus we've got a ways to go before we solve the problem within US sport culture
- is one method for helping athletes better balance the stress of training and competition with needed recovery
- The serves as the physiological foundation for Periodization models of all types
- Sports medicine professionals are encouraged to develop an of periodization concepts and it to the evaluation and treatment of their patients
References


5. D’Hoore, A. (2016). All rights reserved. Use only with permission. April 1, 2016

6. References

D Hoover 2016. All rights reserved. Use only with permission.

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References


69. Hoover DL, VanWye WR, Judge LW. Periodization and physical therapy: Bridging the gap between training and rehabilitation. Phys Ther Sport (Published online ahead of print) http://dx.doi.org/10.1016/j.ptsp.2015.08.003