Athletic Profiling:

Choosing a Periodization Profile to Maximize Individual Performance

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EXOS™

LEARNING OBJECTIVES

- Define and present the basis for using periodization
- Discuss considerations for using periodization
- Discuss periodization profiles for Novice, Intermediate and Advanced athletes
- Discuss general considerations for long-term athlete development

01

THE BASIS OF PERIODIZATION

- ‘Creating a long-term plan’

SHORT HISTORY OF PERIODIZATION

- Kotov (Olympic Sport, 1917)
  - General, Preparatory and Specific Stages
- Matveyev, 1964
  - Former USSR (Eastern Block)
  - Founder of ‘Traditional Theory’

‘subdivision of the seasonal program into smaller periods and training cycles’

Preparatory Period		Competition		Transition
General (GPP)	Special (SPP)	Pre	Main	Transition

(Issurin, 2010, Verkhoshansky and Siff, 2009, Bompa and Haff, 2009)

DEFINING PERIODIZATION

- Kraemer and Häkinnen, 2002
  - 'programmed variation in the training stimuli with the use of planned rest periods to augment recovery and restoration of an athlete's potential'
- Mike H. Stone, 2004
  - 'logical phasic method of varying training volume, intensity factors, and exercises in order to optimize training progress'
- Verkhoshansky and Siff, 2009
  - 'long-term cyclic structuring of training and practice to maximize performance to coincide with important competitions'

PERIODIZATION CYCLE HIERARCHY

Periodization Cycle	Description
Quadrennial Cycle	Multi-year plan: ≥ 4 years
Macrocycle	Description of complete training period: ≤ 1 year
Mesocycle (Phase)	Description of singular training cycle or block: 3-4 weeks
Microcycle	Describes the structural unit of a mesocycle: 1 week
Workout	Describes the structural unit of a microcycle: hours/minutes

PERIODIZATION LOADING PARAMETERS

Periodization Cycle	Description
Volume	Total number of lifts completed in a training session (ex.4lifts x 4sets x 6reps = 96lifts)
Intensity	Quality of each lift measured as power (W), repetition maximum (RM) or percent of 1RM (%1RM)
Volume Load	Total training stimulus and representative variable (ex. 4sets x 6reps x 100kg = 2400kg)
RPE (Cybernetics)	Subjective impact the intensity has on an individual (Each lift/session is rated 1-5 or ↓RPE-↑RPE)

WHY DO WE NEED PERIODIZATION?

- Decrease risk of overtraining
  - Manage fatigue
- Optimize performance over a specific time period
  - 1-3 Peak Events (ex. T&F Indoor/Outdoor)
  - Sporting Season (ex. Soccer)
- Cyclical structure maximizes general and specific preparation
- Accounts for individualization, training status/age and available time periods

PERIODIZATION CONSIDERATIONS

- Peak Performance is achieved when the correct Periodization Profile is selected

- Driving factors should include…
  - Training Goals/Needs
  - Training Time Period
  - Delayed Transformation
  - Transfer of Training
  - Progressions
  - Training Residuals
  - Training Status/Level

DELAYED TRANSFORMATION

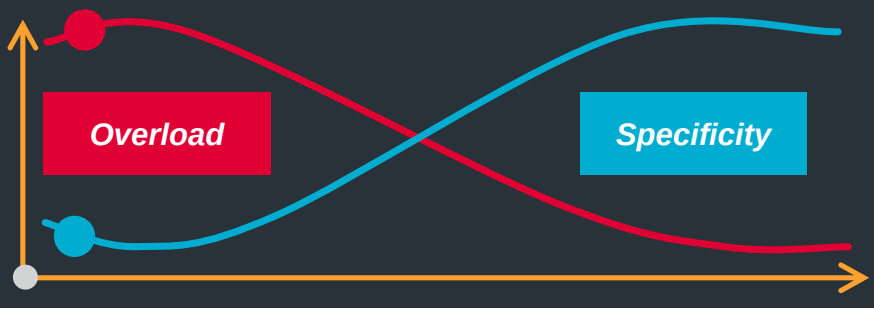
- Fatigue accumulates and gains diminish over the course of a training phase. For desired adaptation to be realized a period of unload/peaking (detraining) should be completed

- Time to peak adaptation is directly related to period of overload
  - 4-weeks of overload will require 4-weeks of unload for specific adaptation to peak

(Issurin, 2010, Verkhoshansky and Siff, 2009, Zatsiorsky and Kraemer, 2006)

TRANSFER OF TRAINING

- Sequential or concurrent development of motor abilities will have a compounding outcome that exhibits positive, negative or no change on performance
- Optimal transfer is the result of complimentary strength and movement qualities being developed in the correct sequence
- Key Consideration...



(Zatsiorsky and Kraemer, 2006)

PROGRESSION HIERARCHY

Motor abilities should be developed in a logical sequence that is general → specific, simple → complex. and slow → fast

Free Sprint →	Specific Movement	→ Starting Strength
Hang Clean →	Specialized Movement	→ Exp. Strength
Front Squat →	Generalized Movement	→ Max Strength

TRAINING RESIDUALS (DETRAINING)

- Length of time a specific adaptation is sustained during a period of detraining where the training stimulus is removed
- Major Limiting Factors…
  - Duration of developmental period (GPP/SPP)
    - 'early to ripe, early to rotten'
  - Training Age/Status
  - Specific Motor Abilities
  - Maintenance Work Completed

(Issurin, 2010, Verkhoshansky and Siff, 2009, Zatsiorsky and Kraemer, 2006)

PERIODIZATION CYCLE HIERARCHY

Based on Issurin & Lusitig, 2004 and Issurin, 2008 and 2010

Adaptive Quality	Detraining	Description
Aerobic System	30 ± 5 days	↑ Mitochondrial/Capillary Density ↑ Aerobic Enzymes ↑ Glycogen Storage
Anaerobic System	18 ± 5 days	↑ Anaerobic Enzymes ↑ H+ Buffering ↑ Glycogen Storage
Maximal Strength	30 ± 5 days	↑ Neural Mechanisms ↑ Myofibrillar Density FT
Strength Endurance	15 ± 5 days	↑ Myofibrillar Density ST ↑ Aerobic/Anaerobic Enzymes ↑ Lactic Acid Tolerance
Maximal Speed	5 ± 3 days	↑ Motor Control ↑ Neuromuscular Function ↑ Phosphocreatine Storage

Training Residuals affect the periodization profile used and should be based on the identified limiting factors in addition to the structure of the competition phase

02

Periodization Profiles

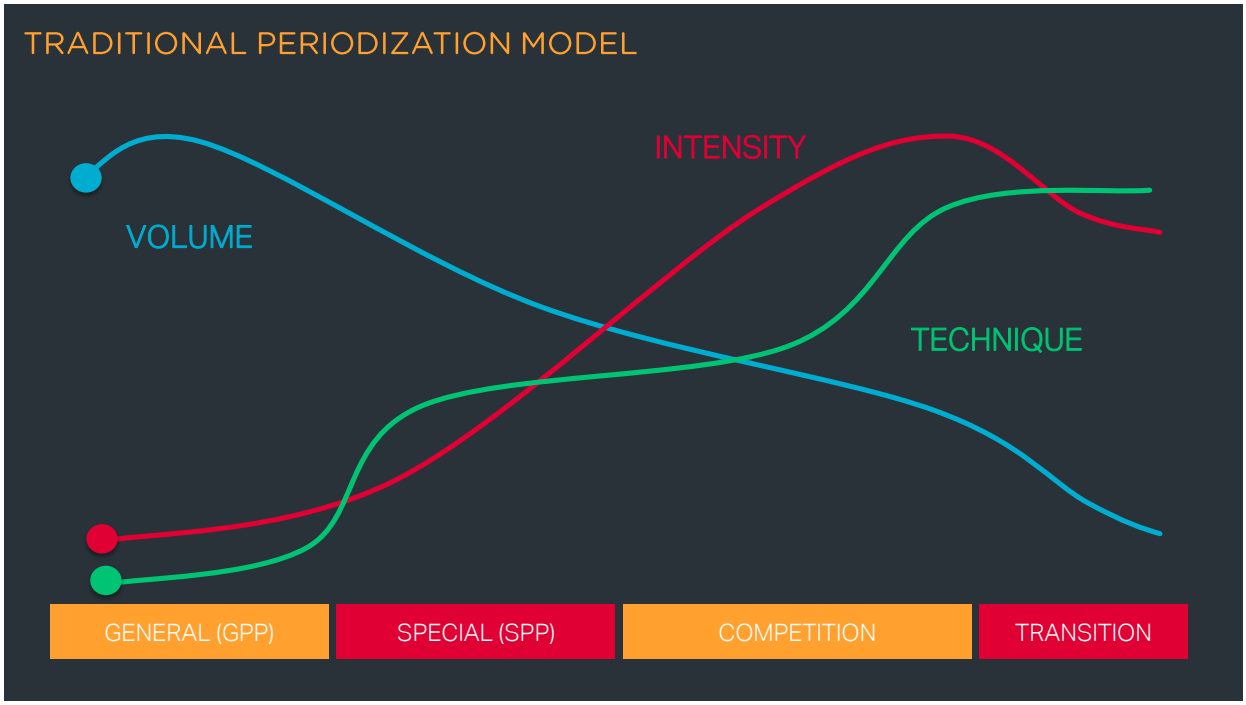
- 'Novice…Intermediate…Advanced'

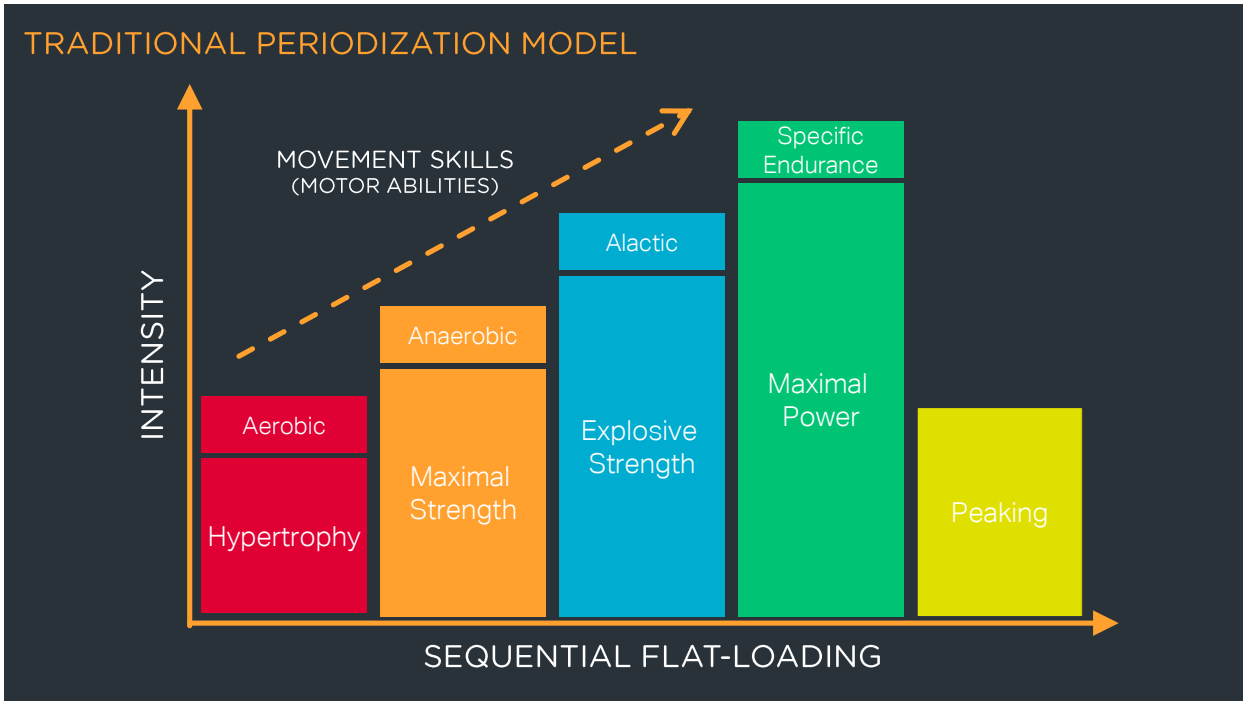
PERIODIZATION PROFILES

- Novice: "Traditional Model"
  - Matveyev, 1964
  - Bompa, © 1983
  - Bompa and Haff, © 2009
- Intermediate: "Non-Traditional Model"
  - Poliquin, 1988
  - Baker et al., 1994
  - Stone et al., 2007
- Advanced: "Conjugate Sequence Model"
  - Verkhoshansky and Siff, © 1993 and © 2009
  - Bondarchuk, 2007
  - Issurin, 2008

NOVICE "TRADITIONAL MODEL"

- Classically: Linear Periodization
  - "Wave like changes in volume and intensity"
- Based on competition schedules versus adaptation-recovery models
  - One, Two and Three Peak Models
- Concurrent development of technical, cardio-respiratory and strength qualities
  - General Preparatory Period (GPP)
  - Special Preparatory Period (SPP)
  - Competition (C)
  - Transition (T)





RESEARCH SUPPORT

Periodization: The Effect on Strength of Manipulating Volume and Intensity

Daniel Baker[1], Greg Wilson[1], and Robert Carlyon[2]

- Subjects: 33m with ≥6 months WT Experience
- Study Design: 12 weeks Non-Periodized, Linear Periodization, Undulating Periodization
- Results: Statistically equal gains in Squat/Bench Press 1RM for all groups
- Conclusion: When volume is equated there is no difference in strength improvement across periodized and non-periodized programs

02 RESEARCH SUPPORT

Effects of Different Periodization Models on Rate of Force Development and Power Ability of the Upper Extremity

Hagen Hartmann, Andreas Bob, Klaus Wirth, and Dietmar Schmidtbleicher

- Subjects: 40m with WT Experience
- Study Design: 14 weeks Linear Periodization, Daily Undulating Periodization
- Results: Statistically equal gains in Bench Press 1RM for all groups and no change in MRFD
- Conclusion: Daily undulating and linear periodization models induce similar increases in 1RM strength in previously trained men

03 RESEARCH SUPPORT

A Comparison of Periodization Models During Nine Weeks With Equated Volume and Intensity for Strength

Thomas W. Buford,[1] Stephen J. Rossi,[2] Douglas B. Smith,[3] and Aric J. Warren[3]

- Subjects: 18m/10w with ≥4 weeks WT Experience
- Study Design: 9 weeks Linear, Daily Undulating and Weekly Undulating Periodization
- Results: Statistically equal gains in Bench Press and Leg Press 1RM
- Conclusion: Daily/Weekly undulating and linear periodization models induce similar increases in 1RM strength in early-phase training

04 RESEARCH SUPPORT

A Comparison of Traditional and Weekly Undulating Periodized Strength Training Programs With Total Volume and Intensity Equated

Jytte M. Apel,[1] Ryan M. Lacey,[2] and Robert T. Kell[1]

- Subjects: 42m with ≥6 months WT Experience
- Study Design: 12 weeks Linear and Weekly Undulating Periodization (WUP)
- Results: Statistically equal gains in Bench Press and Squat 1RM at week 8 with the linear group having statistically higher gains by week 12
- Conclusion: Linear model resulted in greater improvements in 1RM strength past 8 weeks of training compared to WUP

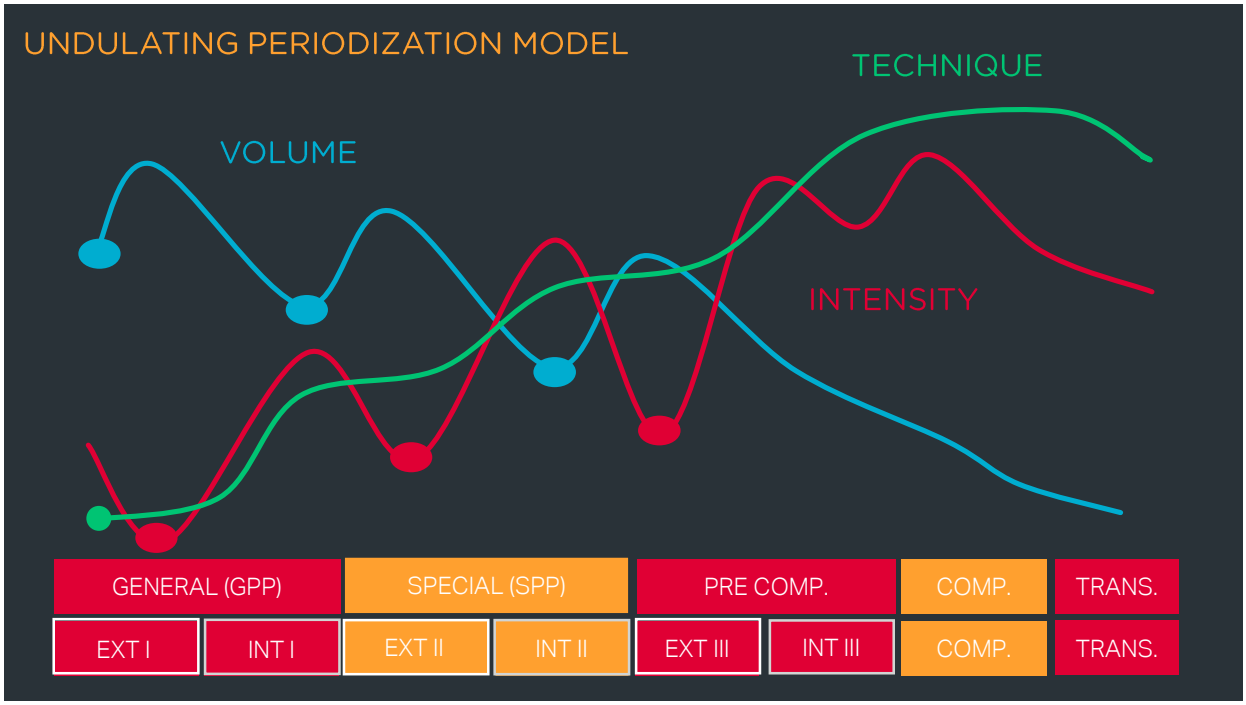
INTERMEDIATE "NON-TRADITIONAL MODEL"

- Undulating Periodization
- Increased variation through frequent changes in volume and intensity
  - Phase
  - Weekly
  - Daily
- Training Periods characterized as extensive or intensive
- Key Concepts…
  - Summated Microcycles
  - Heavy-Light Days

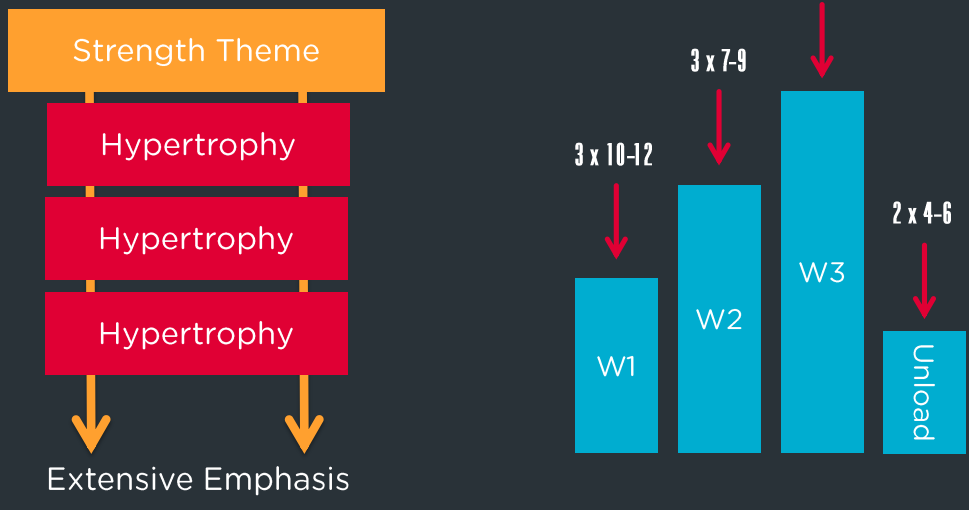
INTERMEDIATE "NON-TRADITIONAL MODEL"

- EXTENSIVE
  - General Prep
  - Endurance
  - Hypertrophy
  - Metabolic
- INTENSIVE
  - Maximal Strength
  - Maximal Power
  - MxStr Endurance
  - MxPwr Endurance

A mix of both Extensive and Intensive themes should be incorporated across programming to elicit a progressive training response



UNDULATING: SUMMATED MICROCYCLES



(Zatsiorsky and Kraemer, 2006)

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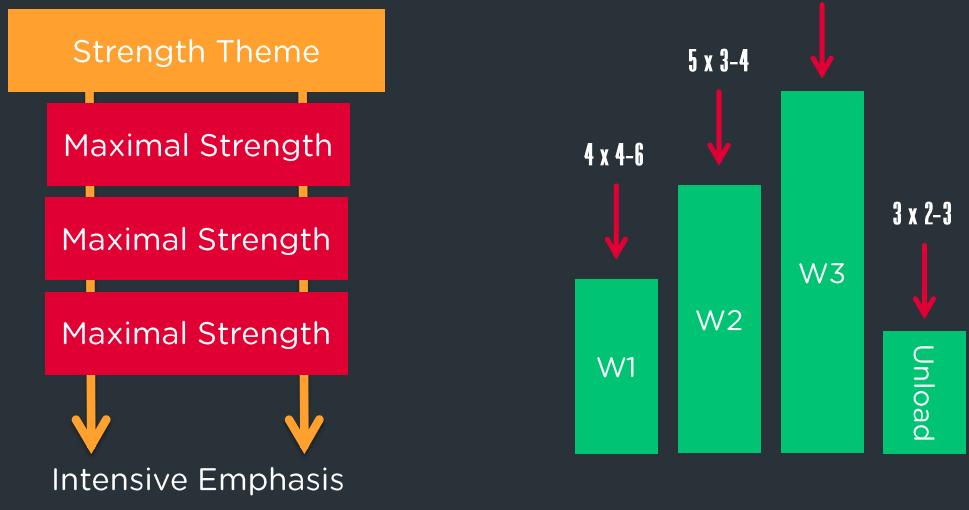

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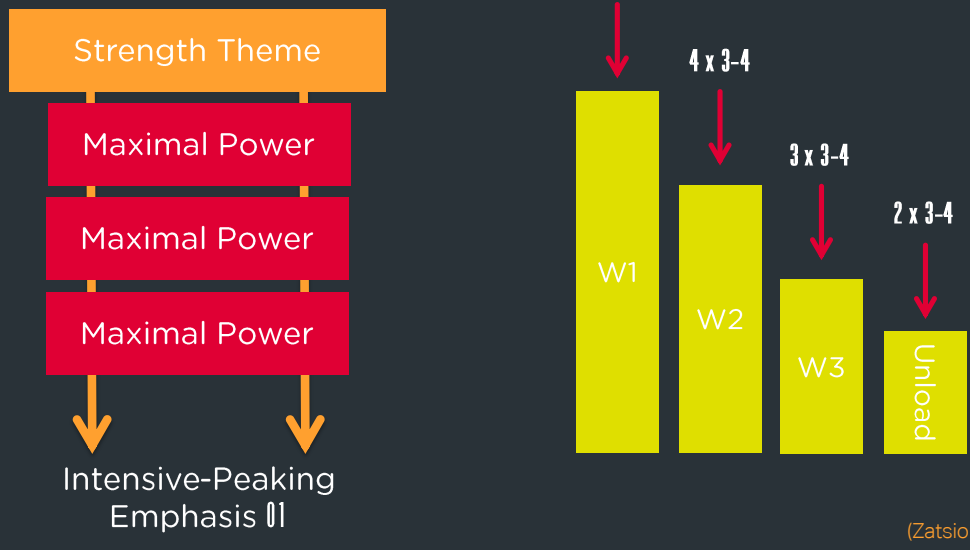

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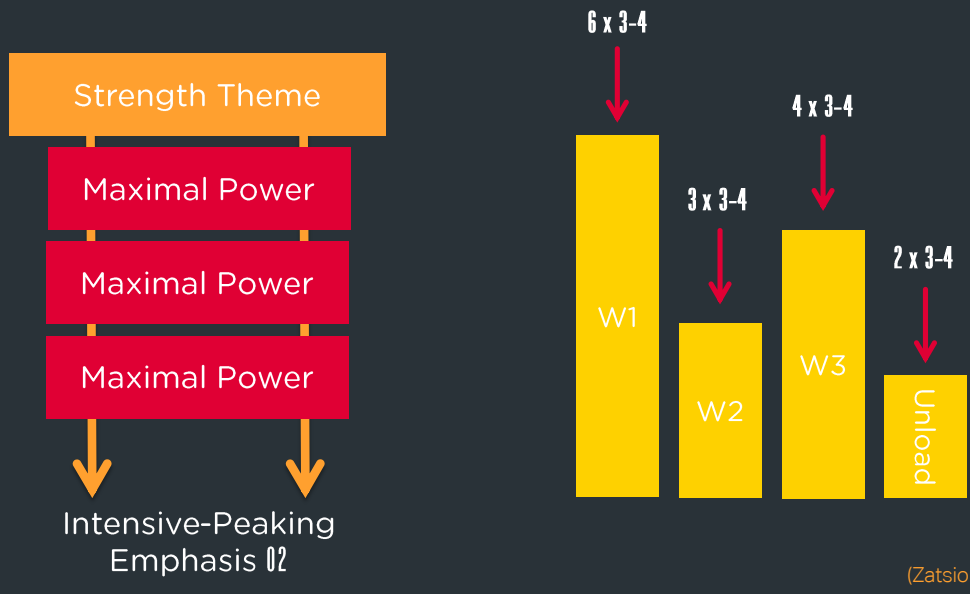

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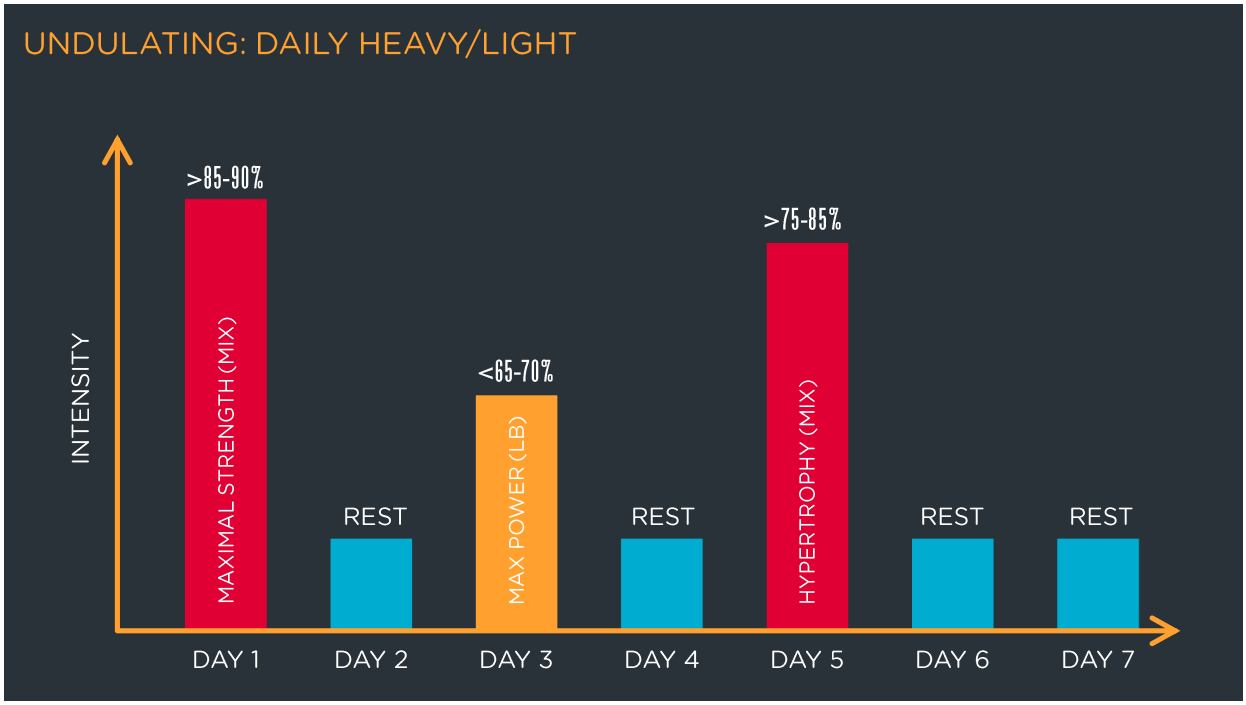
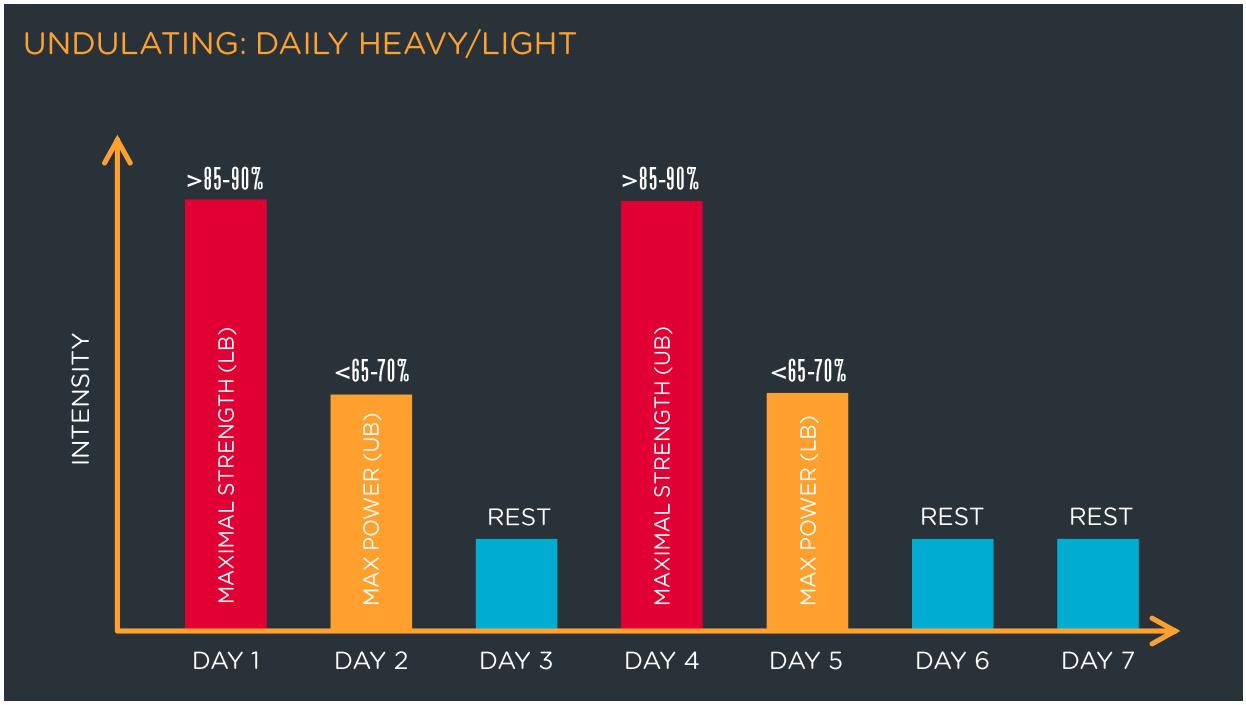

UNDULATING: DAILY HEAVY/LIGHT
INTENSITY
>85-90%
MAXIMAL STRENGTH (MIX)
REST
<65-70%
MAX POWER (LB)
REST
>75-85%
HYPERTROPHY (MIX)
REST
REST
DAY 1
DAY 2
DAY 3
DAY 4
DAY 5
DAY 6
DAY 7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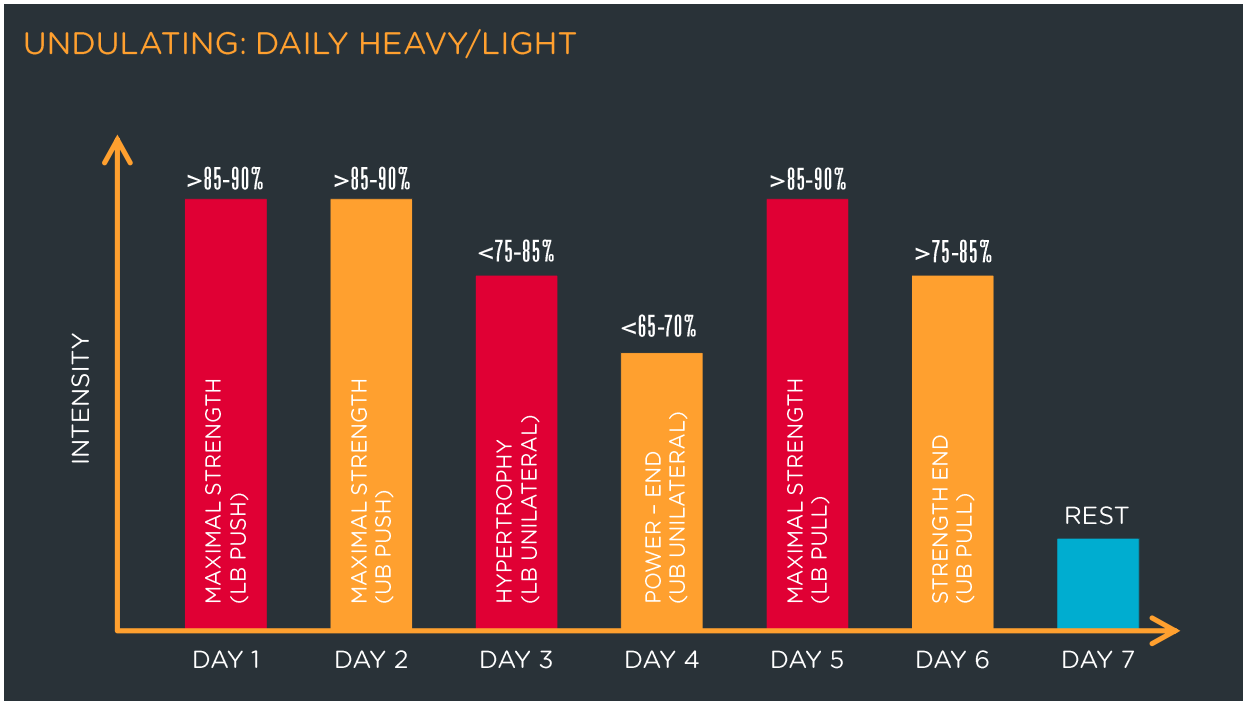


01 RESEARCH SUPPORT

Five steps to increasing the effectiveness of your strength training program

Charles Poliquin
Maximanthropology
Ottowa, Ontario
Canada

Weeks	1-4 (EXT)	5-8 (INT)	9-12 (EXT)	13-16 (INT)
Reps	8-10	3-4	6-8	2-3
Sets	3	5	4	5
%1RM	75-80%	85-90%	80-85%	90-95%

One of the first papers to recommend undulating as a form of periodization for highly trained athletes

02 RESEARCH SUPPORT

UNDULATION TRAINING FOR DEVELOPMENT OF HIERARCHICAL FITNESS AND IMPROVED FIREFIGHTER JOB PERFORMANCE

MARK D. PETERSON,[1] DANIEL J. DODD,[1] BRENT A. ALVAR,[1] MATTHEW R. RHEA,[2] AND MIKE FAVRE[3]

- Subjects: 14 FF in Trained State (FF Academy)
- Study Design: 12 weeks Linear and Dailey Undulating Periodization (3x per week)
- Results: Both groups improved with greater improvement in all strength, power and FF specific measures within daily undulating group
- Conclusion: Daily undulating periodization produces superior results in trained FF compared to a linear approach

03 RESEARCH SUPPORT

A Comparison of Linear and Daily Undulating Periodized Programs with Equated Volume and Intensity for Strength

MATTHEW R. RHEA, STEPHEN D. BALL, WAYNE T. PHILLIPS, AND LEE N. BURKETT

- Subjects: 20m College Students with >2yrs Weight Training
- Study Design: 12 weeks Linear and Daily Undulating Periodization (3x per week) for Leg Press and Bench Press
- Results: Both groups improved leg and bench press strength with statistically greater improvements seen in the DUP group
- Conclusion: Daily undulating periodization produces superior results in previously trained college men compared to linear periodization (Note all subjects reported using a linear based training model prior to starting the study)

04 RESEARCH SUPPORT

Strength Gains: Block Versus Daily Undulating Periodization Weight Training Among Track and Field Athletes

Keith B. Painter, Gregory G. Haff, Mike W. Ramsey, Jeff McBride, Travis Triplett, William A. Sands, Hugh S. Lamont, Margaret E. Stone, and Michael H. Stone

- Subjects: 23m/9f, 18-22yrs, Collegiate Track and Field
- Study Design: 10 weeks Linear (blocks) and Daily Undulating Periodization (3x per week)
- Results: Both groups improved isometric strength and 1RM squat with no significant differences between groups
  - 52% more repetitions and 35% greater VL for DUP
- Conclusion: The use of heavy/light days through relative intensity changes during a linear periodization model may be more efficient for strength and power gains than DUP that uses fixed RMs

ADVANCED "CONJUGATE SEQUENCE MODEL"

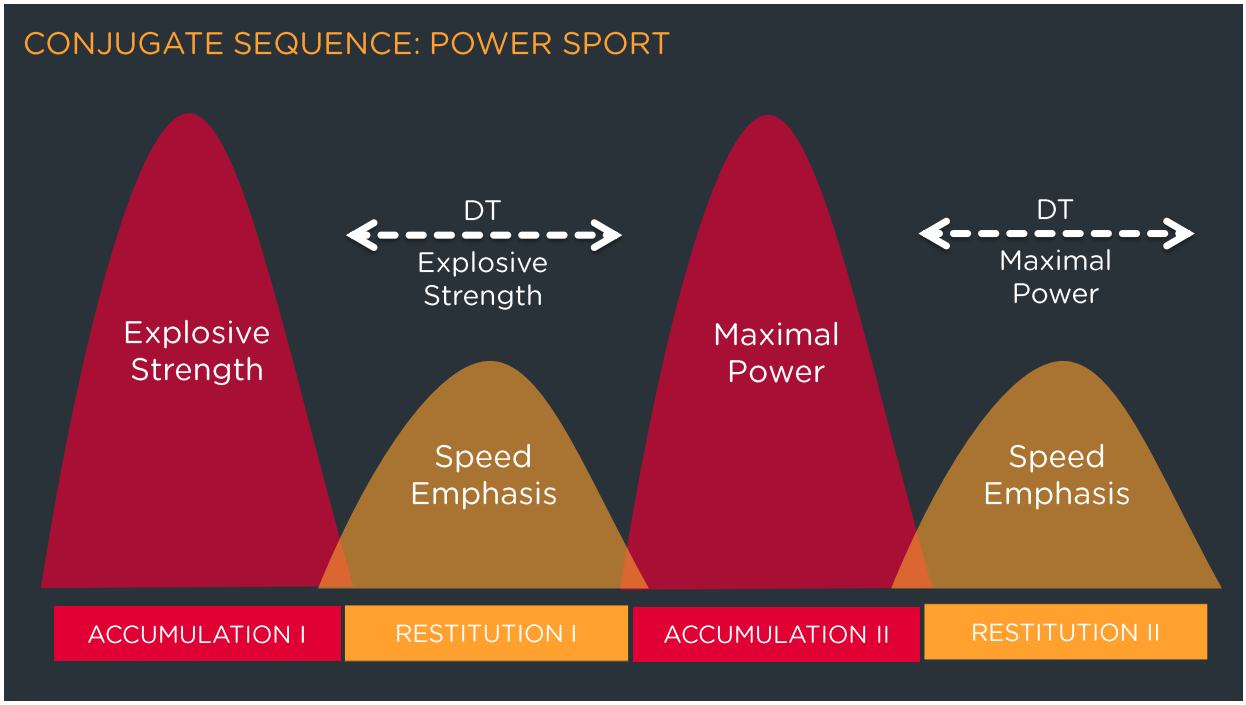
- Originally: "Coupled Successive System"
  - Yuri Verkhoshansky
- Block Periodization
  - *Accumulation Blocks*: Development of specific strength qualities with limited volume load associated with the concurrent development of supporting motor abilities
  - *Restitution Blocks*: Development of specific technical motor abilities with limited volume load associated with the concurrent development of supporting strength qualities

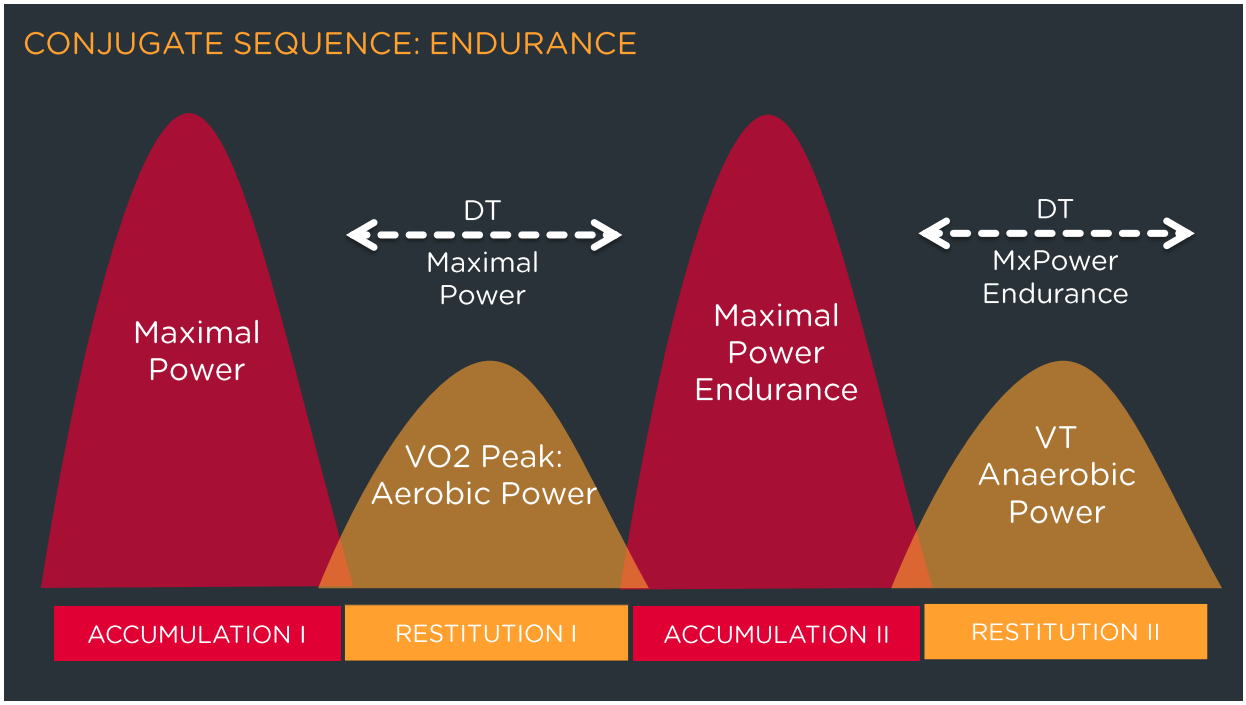
(Issurin, 2010, Verkhoshansky and Siff, 2009, Stone et al., 2007, Plisk and Stone, 2003)

ADVANCED "CONJUGATE SEQUENCE MODEL"

- Unidirectional Concentrated Loading
  - Saturate the system with one specific quality with limited concurrent development of other motor abilities that may have a negative affect on performance
  - Isolated development of one strength quality can have a potentiation affect on the motor abilities developed in the next sequence of blocks through the concept of delayed transformation
  - Increased concentration of loading allows for heightened stress of specific systems, which is needed to create further adaptation in advanced individuals

(Issurin, 2010, Verkhoshansky and Siff, 2009, Stone et al., 2007, Plisk and Stone, 2003)





RESEARCH SUPPORT

Block training periodization in alpine skiing: effects of 11-day HIT on VO_{2max} and performance

Fabio A. Breil · Simone N. Weber · Stefan Koller · Hans Hoppeler · Michael Vogt

- Subjects: 15m/6f ≥3yrs Training Elite Junior Skiers
- Study Design: HIT Group 15 (4x4min) sessions over 11days and CT mixed endurance/strength
- Results: HIT group significantly improved relative VO2max (6%), PPO at VT, and repeated jump test compared to CT
  - Note: HIT PPO on CMJ/SJ ↓ with no change in Jump Height
- Conclusion: Isolated periods of HIT within a block periodization model may be more advantageous in improving VO2max values compared to a mixed approach in elite trained alpine skiers

02-04 RESEARCH SUPPORT

Performance changes in world-class kayakers following two different training periodization models

Jesús García-Pallarés · Miguel García-Fernández · Luis Sánchez-Medina · Mikel Izquierdo

Block periodization *versus* traditional training theory: a review

V. ISSURIN

New Horizons for the Methodology and Physiology of Training Periodization

Vladimir B. Issurin
Elite Sport Department, Wingate Institute, Netanya, Israel

03

Long-Term Athlete Development

+ Periodization Considerations

LONG-TERM ATHLETE DEVELOPMENT

Non-Periodized
(Diverse Skill and
Play Focused)

- Active Start (0-6)
- FUNdamentals (6-8)
- Learning to Train (8-11)
- Training to Train (12-16)

Periodized
1-Novice
2-Intermediate
3-Advanced
+Sport

- Training to Compete (16-23+)
- Training to Win (19+)
- Active for Life

(Adapted from Istvan Balyi, 2009)

04 CLOSING

BASIS | CONSIDERATIONS | PROFILES

- From a historical standpoint, periodization was developed based on seasonal demands and Olympic development cycles
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- Periodization profiles can be broken into novice, intermediate, and advanced profiles

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