

1 Programming

How can we leverage fatigue as asset?

Vertical Integration Overview

- High Low (Vertical Integration) is a means to organize training to accommodate Fatigue during Microcycles
- High requires more recovery due to taxing nature of training on the CNS
- Low requires less recovery (Fatigue Reduction) due to the less taxing nature of training on the CNS
- Organizing the week to allow for recovery following High Days with Low Days to get most from Microcycles

Organize Microcycles to get most from High Intensity Training

High-Low

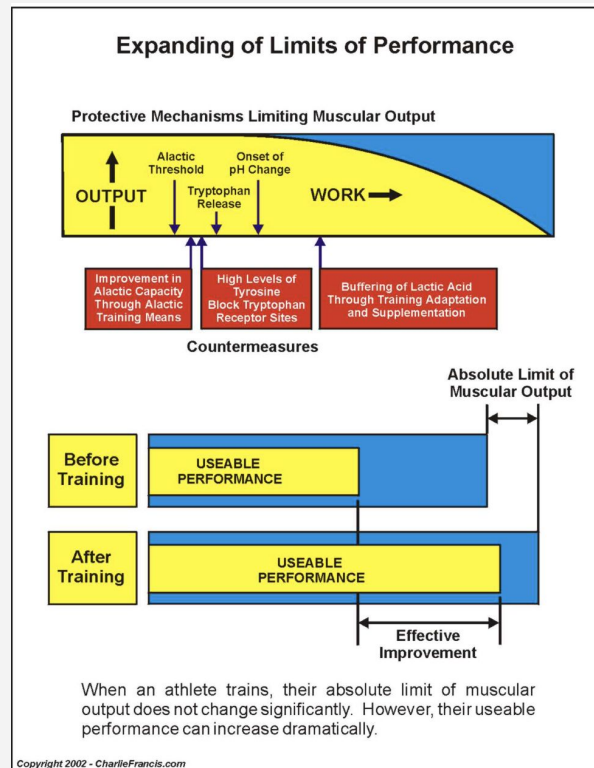
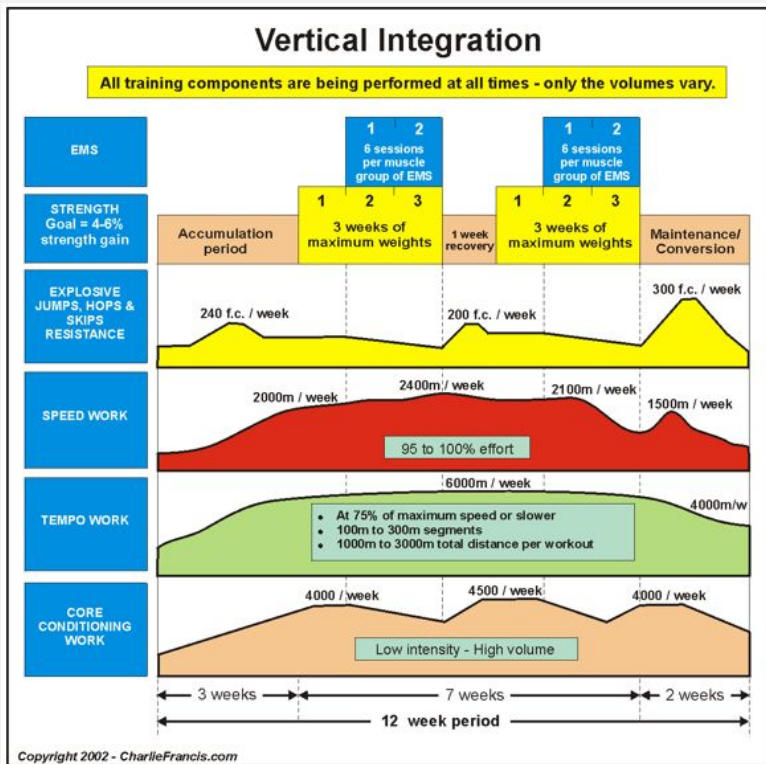
Physiology

- Vertical integration refers to the staggering of training components, intended to **Balance Intensity and Volume.**
 - The key to this **vertical integration scheme is that all training components are being performed simultaneously, at all times, and only the volumes vary, from week to week, from mesocycle to mesocycle**

Improve Rate/Amount of Fatigue from Increasing Energy Resources

- The benefit of maintaining all high intensity elements at all times should be obvious:
 - Guarantees that strength or speed or power accrued will not be lost due to a prolonged downtime
 - Allows for a longer period for improvement at each element

High-Low



Controlled Max Intensity

- **Hormesis** - one man's poison vs another's antidote
 - Excess Fatigue Makes Intensity at certain Volume too Much
 - Controlling Fatigue leads to Better Prediction of Impact of Intensity
- **Duality**

Robust Phosphagen Power/Capacity Needs Robust Oxidative Capacity

Robust Sympathetic Needs Robust Parasympathetic

- How do we Organize the Week to Getting Extreme Levels of the Spectrum?

Key Concepts

Low Intensity runs will be classified as those that do not tax the CNS, and thus need 24 hours or less of recovery time.

- *Runs performed at less than 75% of maximum (best time) are Low Intensity*
 - **They do not tax the CNS, and result in little muscular fatigue as well**

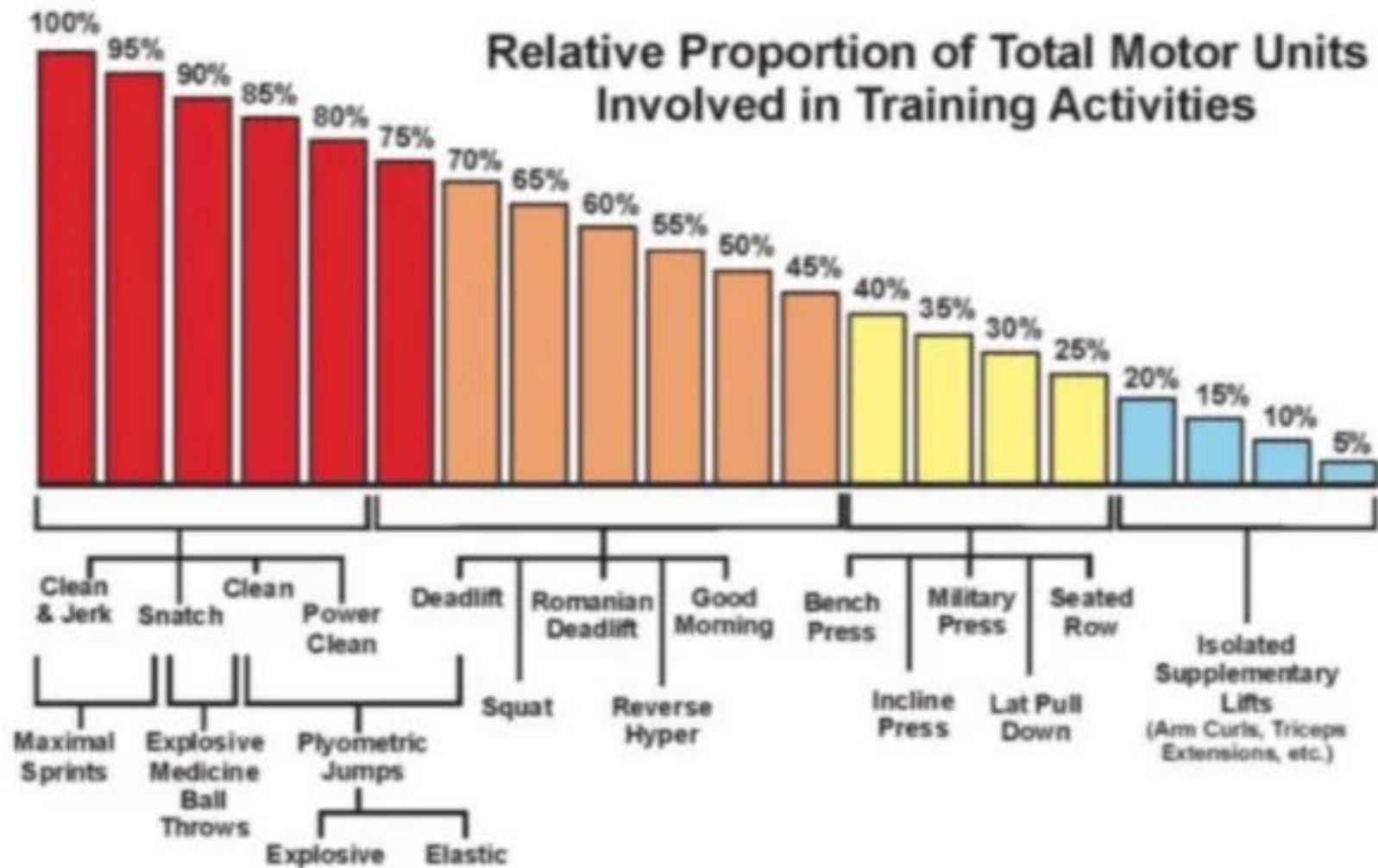
Medium run performed between 76% and 94% of the athlete's best time, "medium intensity." These runs may tax the central nervous system, not necessarily to a great degree, but enough to require more than a 24 hour recovery time

- *Runs performed at less than 75-85% of maximum (best time) are Medium intensity*
 - **They do not tax the nervous system, but do the endocrine system resulting in high levels of muscle fatigue**

High intensity runs are performed at 95% of maximum or over, and will tax the central nervous system quite appreciably, necessitating at least 48 hours of recovery time.

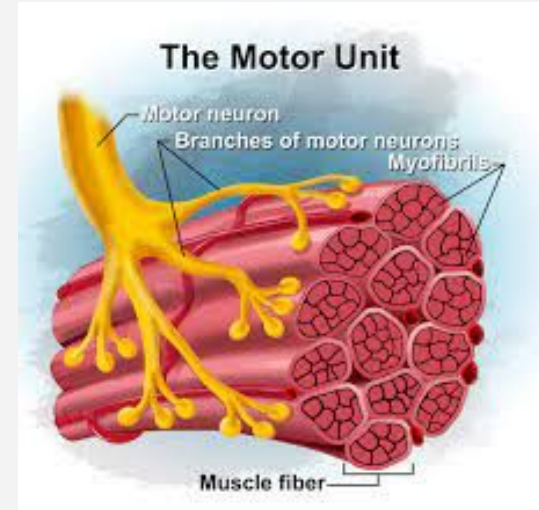
- *Runs performed above 95% of maximum (best time) are High Intensity*
 - **They do tax the CNS, and result in high muscular fatigue**

Relative Proportion of Total Motor Units Involved in Training Activities



Motor Unit Focus

- Higher Threshold Movements
 - More MU equal greater impact on NS
 - Need better diagnostics to determine level of Fatigue
- Compound-Closed Kinetic Chain
 - Bang for Buck
 - More total MU firing
 - Maximal Intensity develops more Broad Fatigue
- Fast Twitch vs Slow Twitch
 - Fast Twitch (Phosphagen) will Fatigue Faster - More MU
 - Increased Fatigue Substrates
 - Slow Twitch (Oxidative) will Fatigue Slower - Less MU
 - Better Fatigue Management
 - MCT1/MCT4 Management of Fatigue from from Fast Twitch



Mitochondria Focus

- Endurance training increases the capacity for lactate oxidation

Development of Oxidative Muscle Fibers Manages Fatigue from Phosphagen

Oxidative Systems and Glycolytic Systems Working at all Times

- Endurance training has been shown to increase expression of SR and mitochondrial MCT-1 and SR MCT4, facilitating the uptake of circulating lactate and intramuscular lactate exchange and oxidation.

Oxidative Fibers w/ More/Better Mitochondria helps LDH Re-Oxidize NADH to NAD for Pyruvate to enter Mitochondria for CAC/ETC

Internal Measurement

- The HRV represents a transition point between lower and higher activity of the SNS, which is strongly correlated with an increase in lactate, catecholamine concentrations, and anaerobic threshold
- HR may be associated with other physiological events, such as a decline in the left ventricular ejection fraction, increased vagal tone, thicker heart walls, and reduced stroke volume
- **Oxidative capacity causes a marked alteration in autonomic function, with a gradual vagal withdrawal followed by sympathetic activation**
 - **Cardiac Output - Stroke Volume, Better O₂ Delivery, Better CO₂ Removal**
- Endurance training increases the capacity for lactate oxidation; in particular, the relative contribution of direct lactate oxidation to total lactate oxidation is increased, regardless of whether subjects are resting or exercising

Micro Organization

- Most Important First
 - **What days have the greatest impact on SNS - High**
 - How many days can we fit w/in Microcycle?
 - **What days will have the greatest impact on PNS - Low**
 - Determined by when and how many High Days?
- Microcycle Length
 - Traditional 7 Day
 - 2-3 High Days
 - 2-3 Low Days
 - 5 Day
 - 1-2 High Days
 - 2-3 Low Days
- Motor Learning vs Training
 - More complex lifts are included on High Low after technical proficiency is obtained
 - Less complex lifts are always accounted for even after higher complexity is added

Meso Organization

- Block - Accumulation/Intensification
 - Consistent Stress from Volume or Intensity
 - Body responds to consistency - More Concentrated Dose (Potential More Fatigue)
 - Muscle Fiber Type
 - Fast Twitch will respond faster - Less High Days
 - Slow Twitch will respond slower - More High Days
- Conjugate - Force/Velocity/Work
 - Varied Stress from Volume and Intensity
 - Body never gets consistent stimulus - Harder to Determine where Results/Fatigue is coming from
 - Muscle Fiber Type
 - Faster Twitch will respond faster - Less High Days
 - Slow Twitch will respond slower - More High Days
- Loading
 - Traditional Relative % - 70/80/90/100%
 - Performance % - 80/90/70/100%

Macro Organization

- Understanding Peaking
 - What will have the biggest impact on performance?
 - OKRs
 - Objective - Increased Anaerobic Capacity
 - Key Result - Increasing Anaerobic Power/Manage Critical Drop Off/Increase VO2 Max
- Contraction Type
 - Concentric or Eccentric
- Bioenergetic Needs
 - Phosphagen Power vs Capacity
- Limiting Factors
 - Fix Weaknesses
 - Accentuate Strengths

Practical

- Build around High Days
 - High Days are most important to peaking strategy
 - Increasing the Deficit - Eccentric Load
 - Bounding/Depth Jumping
 - Max Velo Sprints/Speed Cutting
 - Open/Low Constraint COD Drills
 - Eccentric Focus Weightlifting/Strength Exercises
 - Decreasing the Deficit - Concentric Load
 - MB Throws/Tosses/Static Positions Jumps
 - Acceleration/Power Cutting
 - Closed/High Constraint COD Drills
 - Strong Man/Concentric Focus Weightlifting/Strength Exercises
- High Day Frequency is Contingent on Recovery Rate