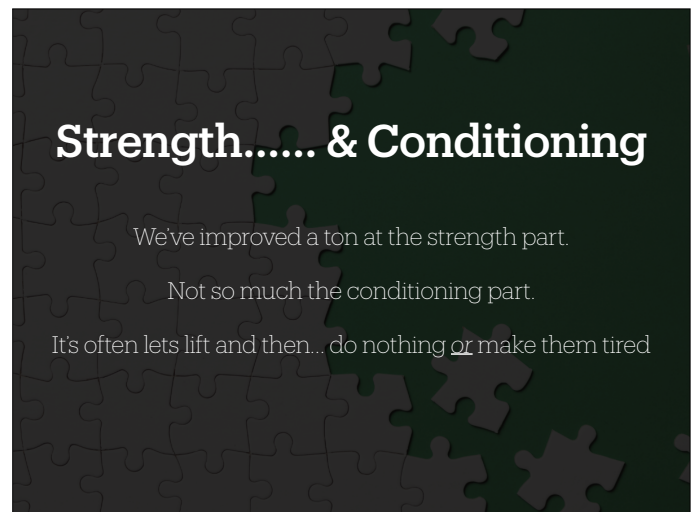
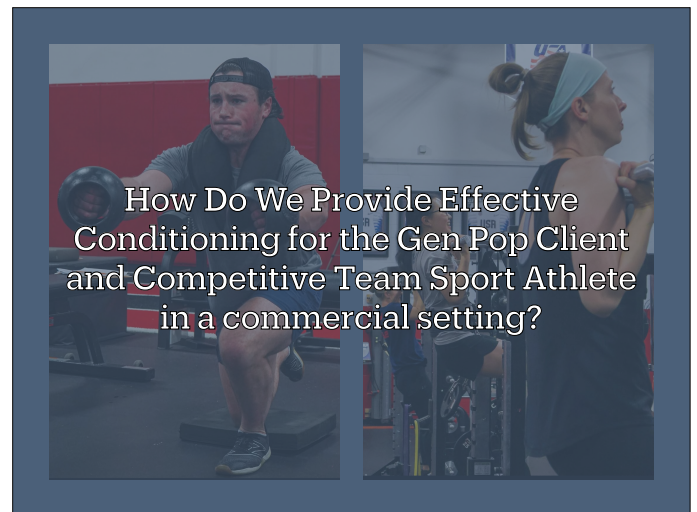
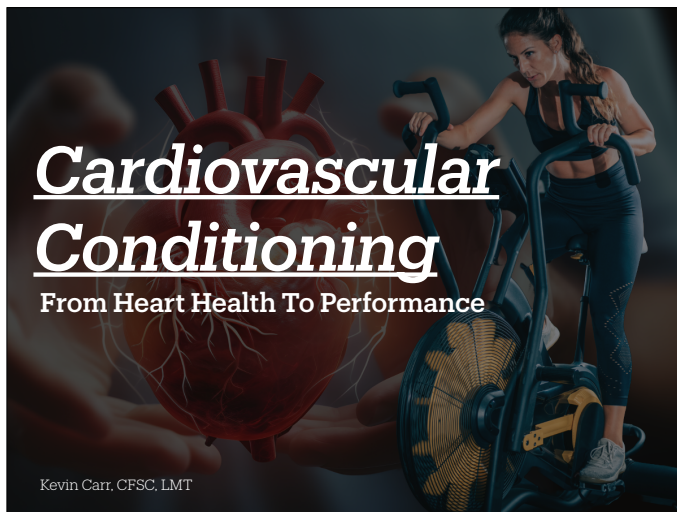




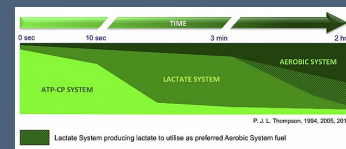
# Conditioning Simplified

## • Gen Pop:

- Training In Any Zone Will Improve Your Cardiovascular Health.
- What can/will they do?
- How can we do it practically?

## • Athletes:

- What does *THIS* Athlete Need?
- What Are The **Work:Rest** Ratios Demanded in the Sport?
- How do I balance with their other competing metabolic demands?



| 3-Zone Model                       | 5-Zone Model                       | 7-Zone Model                  | % HRmax | RPE |
|------------------------------------|------------------------------------|-------------------------------|---------|-----|
| Zone 1: Low-Intensity              | Zone 1: Active Recovery            | Zone 1: Active Recovery       | 55-70%  | < 3 |
|                                    | Zone 2: Aerobic Endurance          | Zone 2: Aerobic Endurance     | 70-80%  | 3-4 |
| Zone 3: Threshold/Medium-Intensity | Zone 3: Threshold/Medium-Intensity | Zone 3: Intense Aerobic/Tempo | 80-84%  | 5-6 |
|                                    | Zone 4: Threshold                  | Zone 4: Threshold             | 84-88%  | 7   |
|                                    | Zone 5: VO2max                     | Zone 5: VO2max                | 88-100% | 8   |
| Zone 6: High-Intensity             | Zone 6: Anaerobic Capacity         | Zone 6: Anaerobic Capacity    | NA      | 9   |
|                                    | Zone 7: Neuromuscular              | Zone 7: Neuromuscular         | NA      | 10  |

# What Does The General Population Client Need?

## The WHY Behind Cardiovascular Exercise?

### > The Gen Pop Client

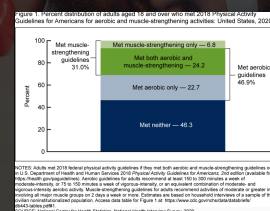
- **Cardiovascular Disease is the number one cause of death in the world.**
  - Every 33 Seconds someone in the United States dies of Heart Disease
- **In the US...**
  - 50% of Adults have High Blood Pressure.
  - 50% are Overweight or Obese.
  - 40% are Pre-Diabetic.
  - Alzheimer's/Dementia is the most rapidly growing disease.

## US Dept. Of Health Recommendations For Cardiovascular Exercise

- **150-300 Minutes** of Moderate Intensity Cardiovascular Exercise
- **75-150 Minutes** of Vigorous Intensity Cardiovascular Exercise
- Or a Combination of the Two
- The flexibility of this recommendation makes it manageable for people to find what works for them.
- Meeting the minimum confers about a 25% Reduced Risk of Mortality independent of all other health factors

## Falling Short Of The Standard

- Less than 50% people meet the MINIMAL Cardiovascular exercise guidelines.
- Just reaching the minimum confers about a 25% risk reduction.
- Just do SOMETHING!





# We Can't Just Lift Weights

I don't fly, that's cardio.

CARDIO?

Weight Lifters

I fear no exercise

YOU MEAN RUNNING TO THE SQUAT BACK BEFORE SOMEONE ELSE GETS TO IT?

Strength Training 2-3x/week fulfills **0%** of your **150-300 minutes per week of Cardiovascular Activity**

**Pre 2000s**

"Cardio, Cardio, Cardio!"

**Common Sense**

**Post 2010**

"Ditch Cardio, Just Lift Weights!"

## All-Cause mortality is directly correlated with VO2 Max

Changing mortality risk based on VO2 max and cardiorespiratory fitness [74]

For every 1 MET increase in VO2 we reduce our CVD risk by about **15%**!

## Use It Or Lose It!

- After the age of 30 the average person's VO2 drops **4-5 ml/kg/min** per decade.
- The rate of decline will continue to accelerate after midlife.
- Cardiac Output Drops
- Max Heart Rate Drops
- Mitochondria density declines
- As Cardiorespiratory fitness drops activities of daily living become more challenging.

## Metabolic Health

If strength training helps us live **BETTER**, Cardiovascular Training helps us live **LONGER**

- Cleveland Clinic:** 90% of Heart Disease could be avoided with exercise, nutrition and avoiding smoking.
- Low cardiovascular fitness** is a statistically bigger risk factor for mortality than **hypertension, coronary artery disease, diabetes and smoking**.
- There are a lot of strong people with cardiovascular disease and pre-diabetes.

Risk of Cardiovascular Mortality In Patients with Hypertension

9 Year Follow-Up

Choi, Youngwan, et al. "Combined association of aerobic and muscle strengthening activity with mortality in individuals with hypertension." Hypertension Research (2024): 1-12.

## Cardiovascular Training and Cognitive Health

"The bottom line is pretty irrefutable: what is good for the heart is good for the brain." - Rudolph Tanzi

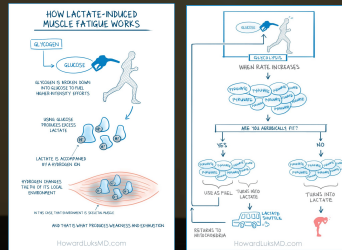
- All versions of cardiovascular exercise ranging from walking, to moderate intensity continuous training to H.I.I.T. have all been shown to have significant impact on the structure and function of our brains.
- Increased Brain Volume - Hippocampus, Prefrontal and Temporal Cortices.
- Improved Executive Function, Memory, Neurological Signaling
- Myokines**
  - Brain Derived Neurotrophic Growth Factor (BDNF)
  - Lactate - Don't be scared of lactate!

# The Lactic Acid Myth

*"Blaming lactate for fatigue is akin to showing up to a big blaze and blaming the fire department for being present."* - George Brooks

- **Lactate + Hydrogen Ions**

- Poor Aerobic Fitness = Limited Ability to clear and utilize Lactate as fuel
- Great Aerobic Fitness = Lactate Shuttling and Usage of Lactate
- Lactate is a preferred fuel at high intensity especially in the brain and heart.
- **Lactate:**
  - Neurological Cell Proliferation
  - Appetite Suppression
  - Cancer Cell Suppression



## What Does The Athlete Client Need?

### The WHY Behind Cardiovascular Exercise?

#### > The Competitive Athlete

- **Fatigue is the primary driver for musculoskeletal injury in sports.**
  - Poor capacity is often a driving factor behind tissue related injuries.
- **Elite and durable athletes need to be able to express strength and power over the length of the ENTIRE competitive match and season.**
  - BUT...Often conditioning in sports performance is overly focused on methods that simply make them tired but don't necessarily make them better.

### Fatigue and Injury Risk

- **Fatigue =**
  - Neuromuscular Impairment/Strength/Coordination (PMID: 31782066)
  - Altered Landing Mechanics (PMID: 39126958)
  - Proprioceptive Decline (PMID: 38311746)
  - Cognitive Impairment/Decision Making (PMID: 39122241)

*"Most of the skill and tactical training undertaken are at 'long slow distance' types of speeds and heart rates.*

*Given that skill and tactical training with the sport coach is the major form of training performed by field sport athletes for most of the season, and this training involves cardiovascular stimulation at the lower end of the 'polarity spectrum,' the role of the strength & conditioning coach is to provide a high intensity stimulus to improve aerobic fitness."*

- Dan Baker

## Fatigue ≠ Value



## "Evaluation of cardiovascular demands of game play and practice in women's ice hockey"

PMID: 12741872

- **Average Working Heart Rate At Practice** - 76% MHR
- **Average Working Heart Rate in Game** - 90% MHR
- **Average Time Spent Above 90%**
  - **Practice:** 5.6 Minutes
  - **Game:** 10.5 Minutes
- They're getting plenty of Moderate to Low Intensity work at practice.
- What they're not getting is high-intensity work....to prepare them to play.
- Playing games is also a stimulus.

## Hockey By The Numbers

Understand The Demands of The Sport

- **Average Hockey Shift:** 39 Seconds
- **Recovery Between Shifts:** 3-4 Minutes (1:2 - 1:3)
- **Total Ice Time:**
  - **Average:** 15-20 Minutes/game
  - **Top Defensemen:** 25-30 min
  - **1st Line:** 20-22 minutes
- **Periodic Rapid Accelerations:** 3-6 Seconds

## Well Designed Practices Can Be Valuable

- 3 v 3 and 4 v 4 Small Sided Games have much higher heart rate demands.
- More often than not, performance coaches will be responsible for developing high-end capacity.
- How do we fit it around an all year sports schedule?
  - Practice and Competing is a stimulus.



## How Can Develop Repeatable Power?

*"The best way to not get tired when you compete is to not get tired when you train." - Charlie Weingroff*

- **Speed and Power is the most valuable quality in team sports.**
  - Elite Speed and Power take a long time to develop and needs to be consistently maintained.
  - Cardiovascular fitness for sports can be maintained relatively easily.
- **Develop Power via Timed Sprints, Plyos, Heavy Implement Power and Strength.**
- **Develop Repeat Power Ability with Sport Specific Cardiovascular Work.**
  - "Feed The Cats": High Outputs and Quality Rest

| Residual Training Effects |           |                                                                                                                                            |
|---------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Motor Ability             | Retention | Physiological                                                                                                                              |
| Oxidative Energy System   | 30±5      | Increased number of aerobic enzymes, mitochondria, capillary density, hemoglobin capacity, glycogen storage, higher rate of fat metabolism |
| Strength                  | 30±5      | Improvement of neural mechanism, muscle hypertrophy                                                                                        |
| Glycolytic Energy System  | 18±4      | Increased anaerobic enzymes, buffering capacity and glycogen storage, higher possibility of lactate accumulation                           |
| Repeat-Power              | 15±5      | Improved aerobic/ anaerobic enzymes, improved local blood circulation and lactate tolerance, repeat sprint ability                         |
| ATP/CR-P                  | 5±3       | Enhanced resynthesis of CR-P                                                                                                               |
| Speed                     | 5±3       | Improved neuromuscular interactions and motor control, increases anaerobic power                                                           |

Adapted from Issurin, V. (2008). "Block Periodization: Breakthrough in Sports Training." New York, NY: Ultimate Athlete Concepts.

*"The best way to not get tired when you compete is to not get tired when you train."*

- Charlie Weingroff

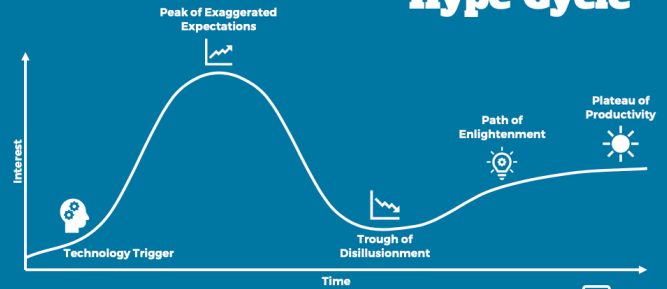
## How Do We Test?

## VO2 Max

- Theoretically relevant, but practically irrelevant.
- Goodharts Law:** "When a measure becomes a target, it ceases to be a good measure."
  - "VO2 Workouts"
- Impractical and not important for the average person or non-endurance athlete.
- High VO2 doesn't equal athletic success.

In other words, when we set one specific goal, people will tend to optimize for that objective regardless of the consequences. This leads to problems when we neglect other equally important aspects of a situation.

## Hype Cycle



## VO2 Max Context

- Highest Ever Recorded:** 97.5 mL/(kg·min) by Norwegian cyclist Oskar Svendsen (Never won a professional race)
- Tadej Pogacar:** 89.4 ml/min/kg (Top cyclist in the world)
- Average NHL Hockey Player:** between 52 and 63 mL·(kg·min)<sup>-1</sup>.

|             | Low  | Below Average | Above Average | High   Elite |
|-------------|------|---------------|---------------|--------------|
| Men 18-19   | 37.8 | 45.2          | 48.6          | 56.7 57.0    |
| Men 20-29   | 38.1 | 41.6          | 47.6          | 54.6 55.0    |
| Men 30-39   | 35.0 | 38.8          | 45.2          | 52.2 52.5    |
| Men 40-49   | 34.3 | 38.2          | 43.4          | 51.1 51.4    |
| Men 50-59   | 28.7 | 34.6          | 39.6          | 48.6 49.0    |
| Men 60-69   | 24.5 | 29.4          | 34.6          | 45.2 45.5    |
| Men 70-79   | 21.0 | 24.2          | 29.4          | 39.9 40.2    |
| Men ≥80     | 17.8 | 21.7          | 25.2          | 34.6 35.0    |
| Women 18-19 | 35.0 | 38.5          | 45.2          | 52.2 52.5    |
| Women 20-29 | 28.0 | 34.6          | 39.9          | 49.7 50.1    |
| Women 30-39 | 27.0 | 32.6          | 37.8          | 47.6 47.9    |
| Women 40-49 | 25.9 | 31.2          | 36.1          | 46.2 46.6    |
| Women 50-59 | 24.5 | 28.0          | 34.6          | 45.2 45.5    |
| Women 60-69 | 21.0 | 24.2          | 29.4          | 38.5 38.8    |
| Women 70-79 | 17.5 | 20.7          | 24.2          | 34.6 35.0    |
| Women ≥80   | 15.4 | 18.9          | 21.7          | 29.1 29.4    |



## Max Aerobic Speed Test

"2 Mile Bike Test"

- 2 Mile time trial to completion**
- "Complete the test at the fastest sustainable intensity"**
  - We don't want ups and downs
- Record:**
  - Completion Time (4-6 minutes)
  - Average RPMs (or Watts)
  - 1 Minute HR Recovery
- Allows us to determine intensity for future efforts**
- More practical reference than VO2.**
  - Measure improvements versus yourself.



## Resting Heart Rate

- Resting heart rate is a key indicator of both **cardiovascular health** and **nervous system activity**.
- Research shows that individuals with higher resting heart rates face an increased risk of cardiovascular disease and all-cause mortality.
- Test first thing in the AM.
  - Pre-Coffee ; )
- Lay down and record resting heart rate.
- Look at averages over time.
- Goal** = < 60 BPM
  - > 60 BPM is indicative of poor aerobic health and excessive stress/sympathetic drive
  - > 60 BPM = Zone 2 Training/Walking



## One Minute Heart Rate Recovery

- The speed at which your heart rate drops in the minute following intense exercise is a strong indicator of both **aerobic fitness** and **parasympathetic nervous system function**.
- Rapidly lowering heart rate following intense exercise = a greater ability to shift from 'fight or flight' (**sympathetic activity**) to 'rest and digest' (**parasympathetic activity**) and higher cardiovascular fitness.
- Abnormal heart rate recovery—defined as a decrease of *fewer* than 12 beats per minute after a graded exercise test—not only had reduced exercise capacity but also faced up to four times the risk of death compared to those with normal heart rate recovery.
- Check Heart Rate Recovery following MAS Test
- **Goal** = 30 BPM or greater

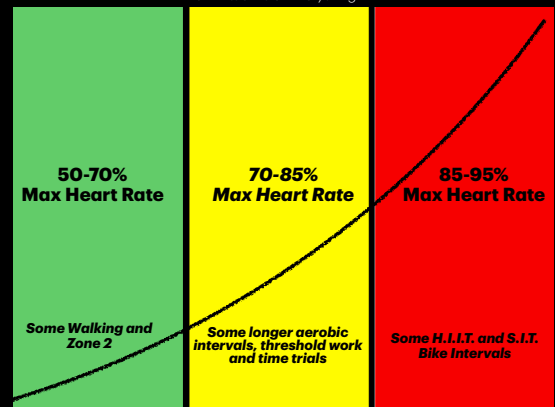
## How To Program

## Programming Gen Pop vs Athlete

- |                                                                                                                                                                                                  |                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• <b>Gen Pop:</b></li><li>• <b>Timeline:</b> Open Ended</li><li>• General Fitness/Health</li><li>• Minimal Competing Demands</li><li>• Voluntary</li></ul> | <ul style="list-style-type: none"><li>• <b>Athlete:</b></li><li>• <b>Timeline:</b> Finite (8-16 Weeks)</li><li>• Specific Energy System Demands</li><li>• Sports Practice, Games, Camps</li><li>• Compulsory</li></ul> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

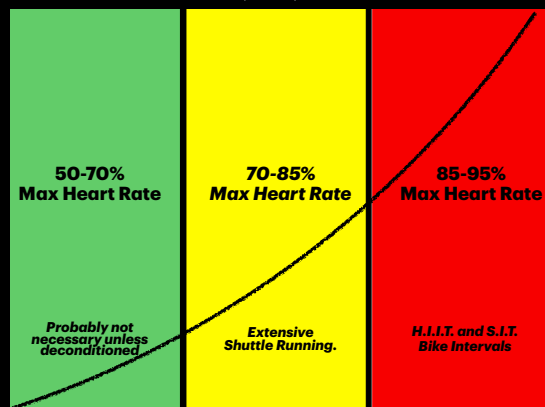
### Basic 3-Zone Model

**Gen Pop:**  
"Do A Little Bit Of Everything"



### Basic 3-Zone Model

**Team Sport Athletes:**  
Specificity



## Beginners

Untrained Gen Pop Clients

- They are going to improve their aerobic health doing anything because their ceiling is so low.
- **Basic Strength Program**
  - 2-3 Days Per Week
- **Start Really Easy:**
  - "Just Ride For 10 Minutes Steady"
  - Incline Treadmill Walk
  - Zone 2 (Walking) in their own time.
  - Get a Heart Rate Monitor and record basic Zone and Intensity
- Crushing them with a bike test or really hard intervals before they get settled in is a great way to lose a client.

## Gen Pop

Athletes and "Phase 2" Gen Pop

- **Do An MAS Test:**
  - The problem with interval training is that most clients/trainers don't prescribe or track specific intensities.
- **Lazily prescribed intervals are either...**
  - Too hard and unsustainable
  - Or Useless
- **Do it yourself so you can communicate effectively with your clients.**
- **Work from Intensive to Extensive**

| Distance | RPM | Percentage |
|----------|-----|------------|
| 2 Mile   | 70  | 100% MAS   |
| 1 Mile   | 72  | 1.03       |
| .5 Mile  | 77  | 1.1        |
| .2 Mile  | 84  | 1.2        |
| 3 Mile   | 67  | 0.95       |
| 5 Mile   | 65  | 0.93       |
| 10 Mile  | 63  | 0.9        |
| :10/:20  | 84  | 1.2        |
| :20/:10  | 77  | 1.1        |
| Zone 2:  | 56  | 0.8        |

|       |    |    |    |    |    |    |    |    |    |    |    |    |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|
| 10.01 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.02 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
| 10.03 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.04 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.05 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.06 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.07 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.08 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.09 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.10 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.11 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.12 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.13 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.14 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.15 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.16 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.17 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.18 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.19 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.20 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.21 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.22 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.23 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.24 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.25 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
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| 10.28 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
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| 10.30 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.31 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.32 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
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| 10.34 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
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| 10.95 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.96 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 10.97 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 10.98 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 10.99 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 11.00 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |

## The Airbike

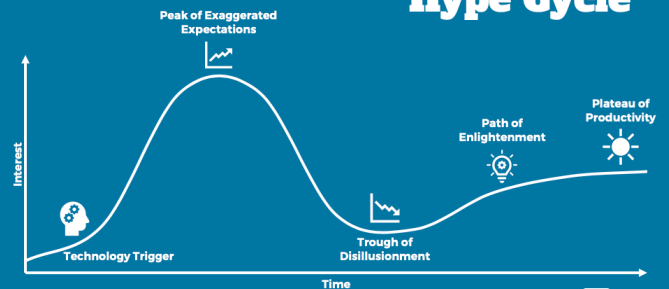
The Perfect Cardiovascular Training Tool?

- **Low Impact**
  - Many Gen Pop clients will not tolerate the running volume required to get fit.
  - Athletes are often already doing a lot of running/impact related work.
- **Zero Technical Learning Curve.**
- **Easy Management of Pace/Intensity**
  - RPMS/Wattage/Time

## Zone 2 Training

- **Cardiac Output**
- 60-70% MHR, 30-90 Minutes
  - "Eccentric Heart" - Charlie Weingroff
  - "Netflix Workout"
- Mitochondrial Density/Function
- Cardiac Output: Valuable to lower Resting HR
- **Time Consuming:**
  - 150-300 minute per week
  - Behavior change and tolerance takes time.
- We're already failing miserably to reach minimum exercise guidelines.
- Can we dedicate time outside of our normal training sessions to accumulate low intensity work?

## Hype Cycle





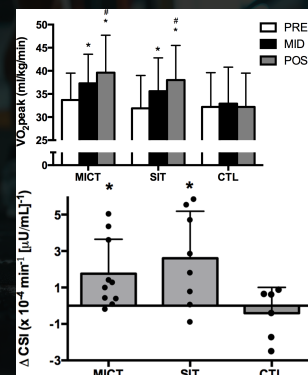
## Implementing Zone 2

- **Outside of Normal Training Sessions**
- **60-70% of MHR or Talk Test**
  - Needed for General Population
  - Poor HR Recovery
  - High Resting HR
  - Really low cardiac output
  - Probably Not Needed For Athletes unless really de-conditioned or injured.
- **Run**
- **Bike**
- **Elliptical**
- **Hike/Ruck**
- **Recreational Activities**

## Interval Training = Efficiency

Twelve Weeks of Sprint Interval Training Improves Indices of Cardiometabolic Health Similar to Traditional Endurance Training despite a Five-Fold Lower Exercise Volume and Time Commitment.

- 12 weeks
- 3 x Week of 3 x :20 "All Out" (2 min rest) vs. 3 x 45 min of continuous at 70% HR
- Similar improvements in VO2 Max, Insulin Sensitivity, and Mitochondrial Content
- 30 Min per week vs 150 minutes per week
- 5X Time Commitment with Continuous Training



## HIIT vs Continuous Training For Improvements in Cardiorespiratory Function

- The key parameter is for improving your aerobic power is to train near or above MAS.
- **Dan Baker Research:** "Recent trends in High Intensity Aerobic Training for Field Sports."
- Interval Work allows us to accumulate more quality reps near our peak.
- **"Perceived lack of time"** is the largest cited reason for not exercising.
- Interval Training is the most accessible tool to start cardiovascular work.

### DAN BAKER

"It didn't matter much if it was 20 seconds work, 10 seconds recovery, 36:15, 15:15, the research has kept pointing to the fact that training at or above 100% MAS was the key intensity parameter and how long you spent there was the driving volume parameter underpinning improvements in aerobic power."

## Rather Than A Base.... Build The Pyramid Upside Down

- For most of our client's time is the biggest constraint, especially if we also care about including strength, power and mobility.
- Prioritize intensity and progressively add volume to maximize efficiency.
- Intervals around MAS Pace will be sustainable.

### INVERT THE PYRAMID TO BUILD WORK CAPACITY- BUILD VOLUME W/INTENSITY

| WEEK 4 | 1:20 | 1:20 | 1:20 | 1:20 |
|--------|------|------|------|------|
| WEEK 3 | 1:20 | 1:20 | 1:20 | 1:20 |
| WEEK 2 | 1:20 | 1:20 | 1:20 | 1:20 |
| WEEK 1 | 1:20 | 1:20 | 1:20 | 1:20 |

## Start With Max Aerobic Speed Intervals

- **Perform MAS Test:** 2 Mile Time Trial
  - Average RPM = MAS
  - Allows Us To Find Appropriate Intensity
- **Start with :10/:20 @ 110-120% of MAS**
  - Progress to :20/:10 @ 110-120%
- **Build Volume and Capacity with Time:**
  - **Week 1:** :10/:20 x 8
  - **Week 2:** (:10/:20 x 8) x 2
  - **Week 3:** (:15/:15 x 8) + (:10/:20 x 8)
  - **Week 4:** (:15/:15 x 8) x 2
  - **Week 5:** (:20/:10 x 8) + (:15/:15 x 8)
  - **Week 6:** (:20/:10 x 8) x 2

## Tabatastrophe

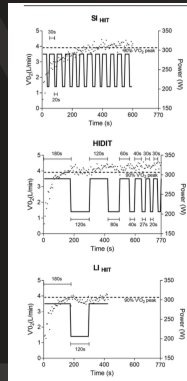
:10/:20 and :20/:10 doesn't = "Tabata"

- The Original Tabata Study was done at 170% of VO<sub>2</sub>!
- **Elite Cyclists:** Only 6/9 Finished the Study
- It's just a work rest ratio..
  - You can't do Tabata squats, burpees etc..

## Decreasing Interval Training

Begin progressing to longer intervals

- A time effective method to spend more time near MAS/90% VO<sub>2</sub>
- More effective when time matched and compared to 3 Minute efforts and :30 repeats to achieve time above 90% of VO<sub>2</sub>.
- **Work:** 3 min/2 min/1 min/40 sec/30 sec/30 sec
- **Rest:** 2 min/80 sec/40 sec/27 sec/20 sec
- Decreasing Intervals Allows Maintenance Of Power Over Time and More Time Spent Near VO<sub>2</sub>
- 1 Mile/.9/.8/.7/.6/.5 etc etc
- Start with: 5/.4/.3/.2/.1?



## One Minute Repeats

- 1:00 On /1:00 Off at Max Aerobic Speed
- Accumulate more time at MAS.
- Develop peripheral adaptations to manage muscle fatigue.

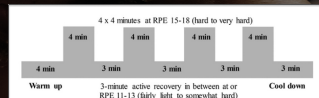
- **Week 1:** x6
- **Week 2:** x7
- **Week 3:** x8
- **Week 4:** x9
- **Week 5:** x10
- **Week 6:** x11
- **Week 7:** x12
- **Re-Test MAS**



## 4 x 4...?

Maybe let's back it up a bit...

- **Norwegian Protocol:**
- **4 x 4 Minutes at "Max Effort"**
  - Race Pace
  - 3 Minutes Rest
- **Works great but almost no one can start with this.**
- **Best Practice for VO<sub>2</sub> is to progressively build volume of time near VO<sub>2</sub>**
  - Most research says 3-8 minutes near VO<sub>2</sub>
- **Build volume progressively**
- **Follow the 1:00/1:00 Protocol and then Progress to..**
  - 2-3 Minute Intervals: 1 Mile?
  - 3-4 Minute Intervals etc etc



## Tempo Running

- Ideal For General Population running to build work capacity.
- **Phase 1:** Athlete Running
- **75% Effort**
  - 75 Yards/15-20 Seconds
  - Rest: 1-2 Minutes
  - Aerobic Intervals
  - Develop Work Capacity

## Shuttle Running

Team Sport Conditioning

- Shuttle Running is probably our best tool for ATHLETES to develop sport specific capacity.
- Change Of Direction: Injuries Happen During Starts and Stops in sports.
- **Progress from:**
  - 75 Yard Shuttles - 15 Seconds
  - 150 Shuttles - 30 seconds
  - 300 Yard Shuttles - 60 Seconds



## Reverse Engineering MAS Pace

| Sport                              | MAS (m/s) | Test            | Reference |
|------------------------------------|-----------|-----------------|-----------|
| Serie A Football                   | 4.91      | Rampinini       | 26        |
| Australian Rules Football          | 5.03      | 2 km Time Trial | 21        |
| Rugby 7s (International)           | 4.26      | Treadmill       | 28        |
| Rugby League                       | 4.36      | MSFT -corrected | 29        |
| Gaelic Football                    | 4.68      | MSFT -corrected | 30        |
| International Hockey               | 4.79      | MSFT -corrected | 31        |
| Middle Distance (1.5-3 km) runners | 6.22      | Montreal        | 32        |
| Endurance Runners (10km)           | 5.79      | Montreal        | 33        |

Baker, D.G. & Heaney, N. (2015). Normative data for maximal aerobic speed for field sport athletes: A brief review. *Journal of Australian Strength and Conditioning*, 23(7), 60-67.

- **75 Yard Shuttle:** 15 Seconds = 4.57 meters per second
- **150 yards Shuttle:** 30 Seconds = 4.57 meters per second
- **300 Yard Shuttle:** 60 Seconds = 4.57 meters per second



# Shuttle Running Progression

Team Sport Conditioning

- Progress From Short Hard Efforts to Longer Extensive Efforts
- Progress From Full Rest to Incomplete Rest

- **Phase 1:** 75 yard Shuttles

- 100% Effort for 15 Seconds
- Nearly Full Rest (60 seconds) 1:4

- **Phase 2:** 150 yard Shuttles

- 100% Effort for 30 Seconds
- Less Than Full Rest (60-90 seconds) 1:2-3

- **Phase 3:** 300 Yard Shuttles

- 100% Effort for 55 Seconds
- Less Than Full Rest (2 Minutes) 1:2



## Design A Program That Meets The Standard

### Gen Pop

- 2-3 Days of Full Body Strength
- 150-300 Minutes of Moderate Intensity Cardiovascular Work.
- 75-150 Minutes of Vigorous Intensity Cardiovascular work.
- Or a combination of both.

|           |                                                      |
|-----------|------------------------------------------------------|
| Sunday    | 60 Minutes Hiking/Brisk Walking                      |
| Monday    | Full Body Strength Training + 15 Minutes of H.I.I.T. |
| Tuesday   | 30 Minutes Steady State Cycling                      |
| Wednesday | Full Body Strength Training + 15 Minutes of H.I.I.T. |
| Thursday  | 60 Minutes Hiking/Brisk Walking                      |
| Friday    | Full Body Strength Training + 15 Minutes of H.I.I.T. |
| Saturday  | Rest                                                 |

## Getting Them To Actually Do It

- **Make time for it in the 60 minutes that you have.**
  - Do it on your own afterwards = Not Happening.
- **Provide The Illusion of Choice**
  - "Would you like to do :10/:20s or Tempo Runs today?"
- **What low-moderate intensity activities do they enjoy?**
- **Educate on the Importance.**
- **Do it with them.**

## Cardiovascular Case Study

"Steve"

- Joined to Improve Cardiovascular Health (Lipids/BP), Mental Health and Body Comp.
- **Resting Heart Rate** = 80 BPM
- Previously Struggled with Interval Training.
- **MAS Test** = 6:00 Minutes
  - **MAS** = 52 RPMS
- **Off Days** = Walking with HR Monitor (60+% HR)
  - Went from < 4,000 steps/day > 9,000 steps/day
- **In the Gym:** MAS intervals post lift
  - 110-120% MAS: :10/:20 > :15/:15

## Conditioning Program For The Team Sport Athlete

4 Day Athlete - Four Phases

- **Phase 1:**
  - Tempo Running: Work Capacity (2 Days)
  - MAS Intervals (2 Days)
- **Phase 2:**
  - Tempo Running (1 Day)
  - MAS Intervals (2 Days)
  - Shuttle Runs - 75 Yards (1 Day)
- **Phase 3:**
  - Tempo Running (1 Day)
  - MAS Intervals (2 Days)
  - Shuttle Runs - 150 Yards (1 Day)
- **Phase 4:**
  - Tempo Running (1 Day)
  - MAS Intervals (2 Days)
  - Shuttle Runs - 300 Yards (1 Day)

|                | Day 1                | Day 2                           | Day 3                 | Day 4                                 |
|----------------|----------------------|---------------------------------|-----------------------|---------------------------------------|
| <b>Phase 1</b> | Tempo Run<br>8/10/12 | MAS Test +<br>(:10/:20 x 8) x 2 | Tempo Run<br>8/10/12  | :10/:20 x 8<br>+<br>(:10/:20 x 8) x 2 |
| <b>Phase 2</b> | 75 Yard Shuttles     | (:15/:15 x 8) x 2               | Tempo Run<br>14/15/16 | (:15/:15 x 8) x 2                     |
| <b>Phase 3</b> | 150 Yard Shuttles    | (:20/:10 x 8) x 2               | Tempo Run<br>16/16/16 | (:20/:10 x 8) x 2                     |
| <b>Phase 4</b> | 300 Yard Shuttles    | MAS Test<br>(:30/:30)           | Tempo Run<br>16/16/16 | :20/:10                               |

## In Summary...

In Case You Fell Asleep

- **Everyone** Needs To Do Cardiovascular Work and Most Of Us Aren't Doing Enough.
- Gen. Pop should accumulate whatever they can in any zone based on preference and convenience.
- Athletes should be focusing on high quality top end work so long as it doesn't interfere with competing.
- Start with low volumes and build progressively.
- Thank You!