

The REAL Fat Burning Zone

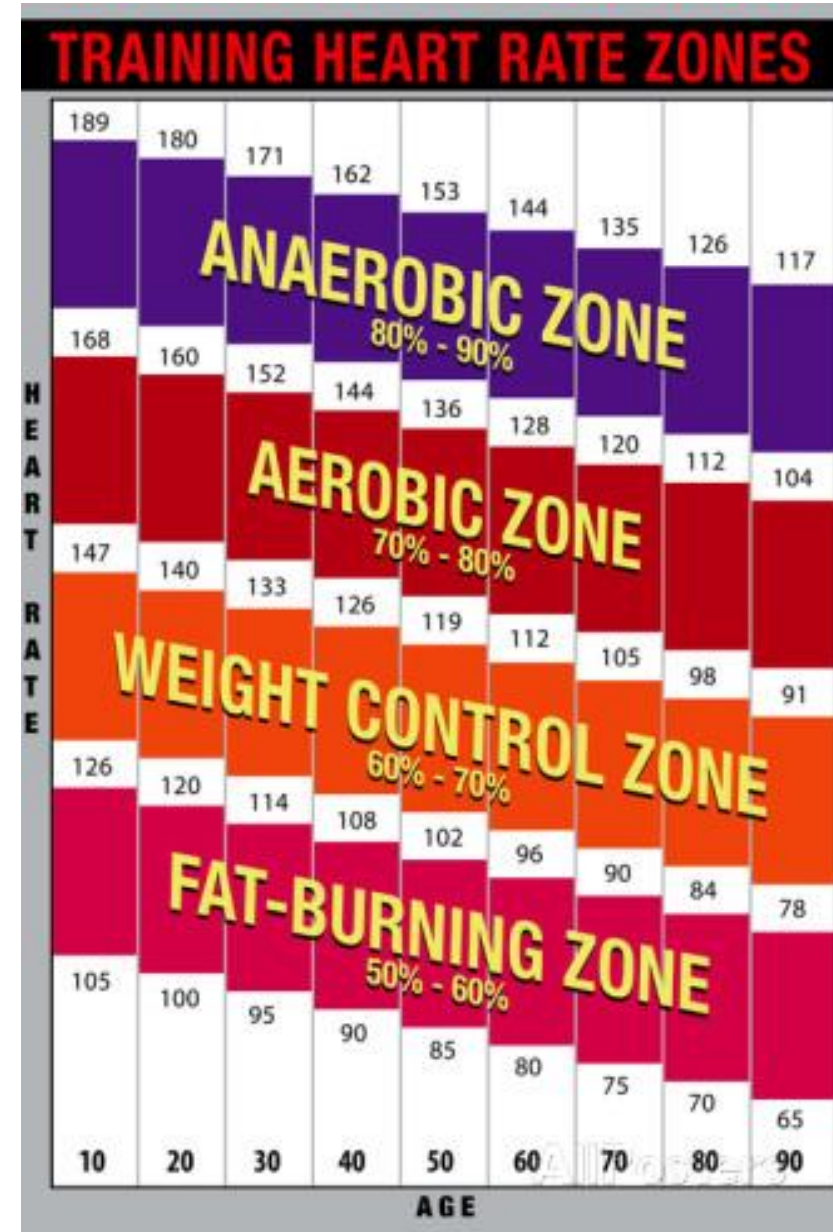
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The REAL Fat Burning Zone

- The Fat Burning zone exists but it has been misinterpreted.
- The body burns a greater percentage of fat at lower intensities.
- Exercise intensity and mitochondrial density are key.
- It's all about metabolism.



ABOVE

ZONE 5

The heart adapts to the needs of our bodies and the heart rate is the measurement of the work our heart does.

ZONE 4

Maximum Heart Rate (HrMax) – Highest number of beats per minute (bpm) that an individual can achieve in an all out effort.

ZONE 3

Calculated by the formula: $220 - \text{AGE} = \text{Maximum heart rate}$,
Karvonen Method: $(\text{HR Reserve} \times \text{Training}\%) + \text{Resting HR}$

Or

Borg's Rates of Perceived Exertion

ZONE 2

ZONE 1

Good for establishing 'zones' for training intensity.

Which Burns More FAT?

30 Minutes of Exercise

Fat Calories

Glycogen Calories

Energy Expenditure

Low Intensity Group (50%)

200

High Intensity Group (75%)

400

Energy Development Systems

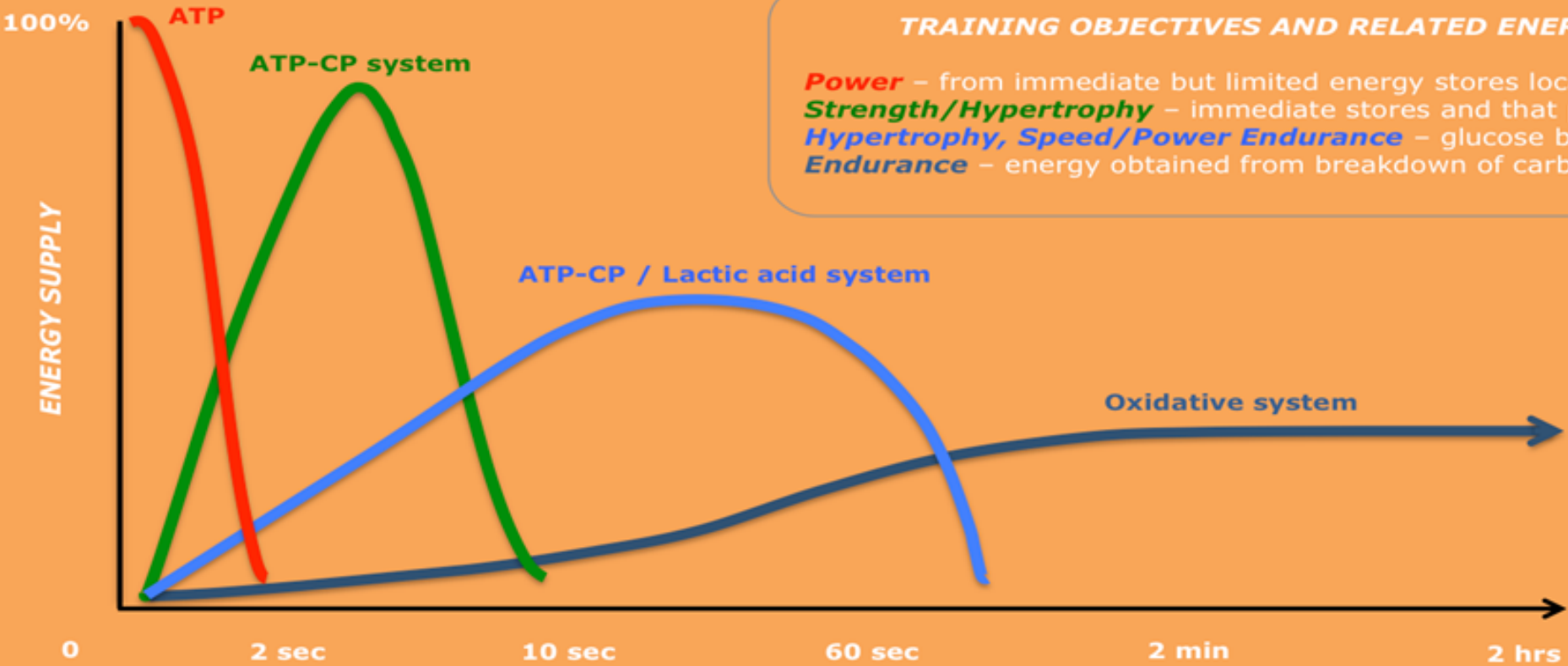
Anaerobic Alactic (Immediate) Phosphagen System

Anaerobic Lactic (Short Term) Glycolytic

Aerobic Glycolysis and Fatty Acid Oxidization (Long Term)

Energy Development Systems at Work

How interplay between energy pathways dictates training objectives



TRAINING OBJECTIVES AND RELATED ENERGY SOURCES

- Power** – from immediate but limited energy stores located in the muscle cells
- Strength/Hypertrophy** – immediate stores and that produced in the muscle
- Hypertrophy, Speed/Power Endurance** – glucose breakdown to lactic acid
- Endurance** – energy obtained from breakdown of carbohydrate and fat stores

Aerobic
AeT

Anaerobic
AnT

Bottom Line

“True HIIT has origins in performance, whereby an athlete aims to get bigger, stronger or faster, or enhance sustained performance (e.g., 45 seconds on the ice).

The training purpose is to systematically overload systems with intense training through repetitions (e.g., 5 seconds of 40-yard sprints) and, then, take appropriate recoveries to enable near maximal performance or sustained intensities (e.g., specific wattage or load).”

Bottom line, this is not always what we are seeing done in workouts that are labeled HIIT and that has a variety of consequences.

~Fabio Comana, exercise physiologist and well-known fitness industry educator

Interval Training Throughout History

Designing HIIT for maximal EPOC response

| | Max | Work:rest | | Work Volume |
|--------------|------------|------------------|--|--------------------|
| • ATP-CP | | | | accumulated |
| • Glycolytic | | | | accumulated |
| • Oxidative | | | | accumulated |

****work % MHR rest % MHR recovery % MHR****

Work to rest ratio will depend on fitness level of participants

Physiological and Metabolic Adaptations

- Healthy young and older men and women can improve cardiorespiratory fitness (VO_{2max}) 4%–46% in HIIT training periods lasting 2–15 weeks. Kessler, Sisson & Short (2012)
- HIIT increases mitochondrial biogenesis (the size and number of mitochondria increase, allowing the cells' energy-producing organelles to make more ATP), which readily translates into improved cardiovascular capacity at any level of exercise intensity. (Weston et al 2014)
- Mitochondrial density increases - up to 35% bigger and can reproduce 15-50% more (Kenney et al 2015)
- Essential to the maintenance of skeletal muscle function. HIIT significantly increases PGC-1 α “the master switch” believed to be involved in increased fat oxidization and slow twitch muscle fibres oxidative capacity (Laursen P.B. 2010)
- The fluctuation of ATP turnover in interval training activates signaling pathways, which increase PGC-1 α (Daussin et al 2008)
- Insulin sensitivity, which describes the ability of the body's cells to take up or metabolize glucose (ADA 2013), typically increases during and after exercise. Boutcher (2011) and Kessler, Sisson & Short (2012) comprehensively reviewed studies investigating the effect of HIIT on insulin sensitivity and glucose metabolism: 19-58% increase

Physiological and Metabolic Adaptations

- Boutcher (2011) - striking surge in epinephrine and norepinephrine from HIIT training may be a catalyst for improving fat loss. Both of these fight-or-flight have been shown to drive lipolysis and are largely responsible for the release of fat from both subcutaneous and intramuscular fat stores for use as fuel during exercise.
- Specialized β -adrenergic receptors on fat cells are known to activate lipolysis (Boutcher 2011). More β -adrenergic receptors have been found in deep abdominal fat (visceral fat) than in subcutaneous fat.
- Notable changes in body weight/percent body fat require at least 12 weeks of HIIT. However, assessing specific HIIT results for clients is somewhat speculative because changing people's body composition depends on a weight management program that finds an optimum mix of exercise, dietary intake and behavior changes Kessler, Sisson & Short (2012).
- Review of 12 studies that examined the effect of HIIT on blood pressure. Authors report consistent HIIT for up to 10 weeks has not shown any measurable effects on resting blood pressure in people with hypertension. The researchers conclude that people with elevated blood pressure (and not hypertension medicine) need at least 12 weeks of HIIT training to see an appreciable reduction (2%–8%) in systolic and diastolic blood pressure Kessler, Sisson & Short (2012) .

Physiological and Metabolic Adaptations

- Maximal peak power output measured in watts, typically performed on a cycling ergometer, increased by 19.4% with HIIT programs (Weston et al 2014).
- Anaerobic power as measured by Wingate 30 sec power test increased 5-28% (Boutcher 2011).
- Heavy weight training and HIIT workouts appear to be superior to steady-state running or lower-intensity circuit training in creating EPOC (LaForgia, Withers and Gore, 2006).
- The increased ventilation, blood circulation and body temperature above pre-exercise levels (Borsheim and Bahr, 2003)
- Recent studies demonstrate that with aerobic exercise, high intensity and/or a combination of higher intensity with duration significantly influences EPOC. With resistance training, higher-intensity exercise with shorter rest periods meaningfully influences EPOC Paoli et al (2012).
- The magnitude and duration of EPOC appear to be quite sustained, with well-controlled studies showing elevations in resting energy metabolism for up to 24 hours Knab et al (2011).