Energy Systems

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Energy Systems

- Anaerobic alactic
- Anaerobic lactic
- Aerobic

- Active recovery
- VO_2 Max

- Muscle types

Energy Systems

- Adenosine tri-phosphate (ATP)
- ATP = Energy
- Resting ATP about 100g

- Training does not improve ATP concentration
- Increases rate of ATP resynthesis
- ATP produced when concentration level drops
- Produced from fats, carbohydrates, proteins

Anaerobic Alactic

- Creatine phosphate system (CrP)
- CrP → ATP (1 chemical reaction)
- Fast release of energy

- Low stores of CrP
- Explosive bursts (<20s)

- Training cannot increase capacity of CrP storage
- Improve efficiency of breakdown of CrP → ATP
- More power

Anaerobic Alactic

- Sprints

  CrP reaction = 1 clap

  Slow sprinters vs Fast sprinters

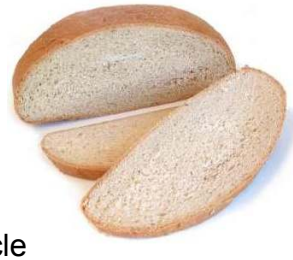
- Speed / Agility drills

  Train body to CrP → ATP faster

  Stairs, ladder, sprints drills, suicide drills, box jumps

Anaerobic Lactic

- Carbohydrates stored in body as glycogen
- Glycogen → Lactic Acid (13 chemical reactions)
- Energy released is used to make ATP
- Slower (<30s)

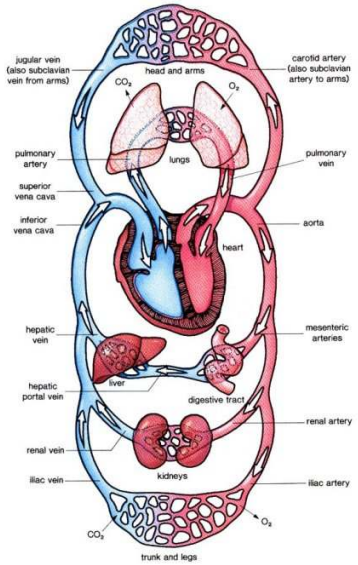


- Acidosis = build-up of lactic acid
- Main cause of fatigue

- Muscle ache = micro tears in muscle

Aerobic

- Fats/Carbohydrates + Oxygen → Energy
- Transfer of fuel from different organs
- Heart → Lungs → Heart → Muscle
- Endurance activities (>30s)



Aerobic

- Training can improve aerobic capacity
- Improve efficiency in heart and lung functions
- Fitness base for all activities
- Remove lactic acid build-up

Energy Systems

In any activity, all 3 energy systems are in use. The type of activity determines the system which will be the main provider of energy to sustain that activity over a certain period of time.

A 100m sprinter utilize the anaerobic alactic system much more than the aerobic system.

However, the other energy systems should not be neglected during training.

Active Recovery

- Accumulation of lactic acid → Acidosis
- Main cause of fatigue

Removal of lactic acid build-up:

- Oxygen dependent
- Rest about 30 mins
- Engaging in low intensity aerobic activity

Lactic acid does not contribute to muscle aches.

Muscle aches are the result of muscle cells tearing due to exercise demands or intensity.

Active Recovery

- Static stretching
- Walking
- Deep breathing
- Cycling
- Slow jog

Aerobic activities reduces muscle aches and improves muscle recovery by increasing oxygen intake for cell repair.

VO_2 Max

Maximal amount of oxygen that can be transported to and consumed by the working muscle in exercise.

VO_2 Max

Training can increase VO_2 max levels through the strengthening of cardio muscles.

A healthy and fit person has a lower heart rate than an untrained person. A strong heart can pump more blood in one beat, and can beat faster during high intensity exercise.

- Heart size → Sponge size
- Cardio muscle → Fist strength
- Blood volume → Water volume

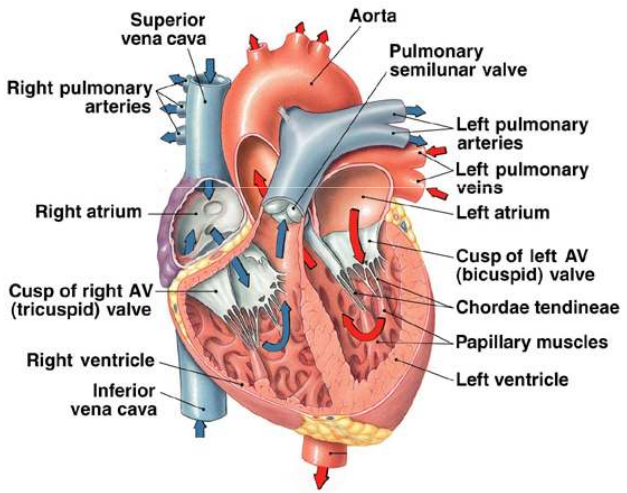
VO_2 Max

- Maximal aerobic capacity
- Can increase to 10 – 20 times from resting rate
- Depends on age, gender, endurance fitness

Factors affecting VO_2 Max:

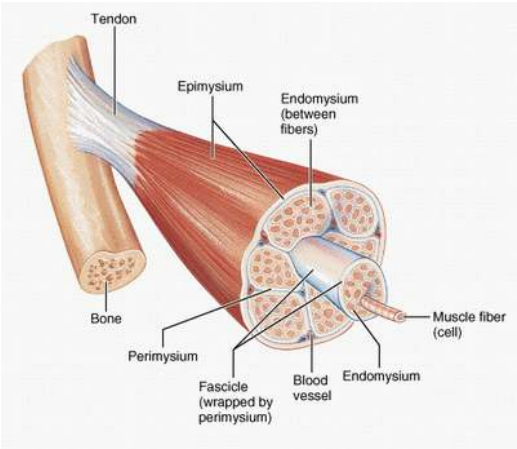
- Maximal heart rate (MHR)
- Maximal stroke volume

VO_2 Max

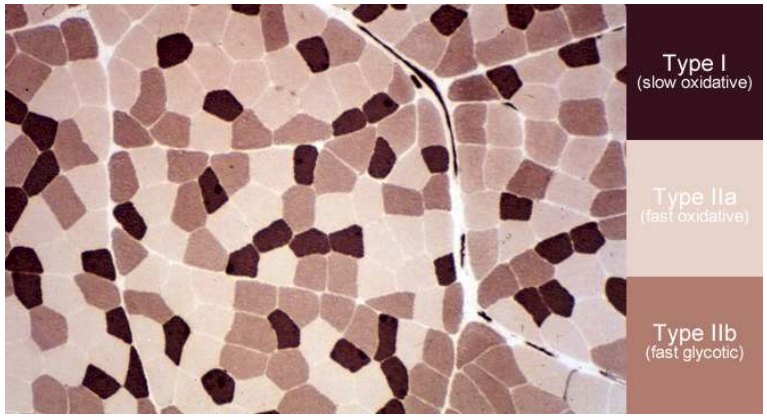


Muscle Types

Muscle types are fixed at birth at approximately 50% Type I and 50% Type II muscles in the entire body.



Muscle Types



Muscle Types

Type I: Slow twitch, red muscle fibres
- Aerobic, fat burning
- Endurance activities

Type IIa: Fast, oxidative muscle fibres
- Anaerobic and aerobic
- Faster

Type IIb: Fast twitch, white muscle fibres
- Anaerobic, speed and power
- Fatigue quickly, takes longer to recover

Muscle Types

The composition of the muscle types varied from muscle groups to muscle groups (eg. biceps, quadriceps).

While muscle types composition remains the same in a person, it is possible to shift between Type IIa and Type IIb with training.

Therefore, while not everyone can be the fastest sprinter, you can still train to be as fast as your body allows after your muscles have been trained and conditioned to perform the required activities.