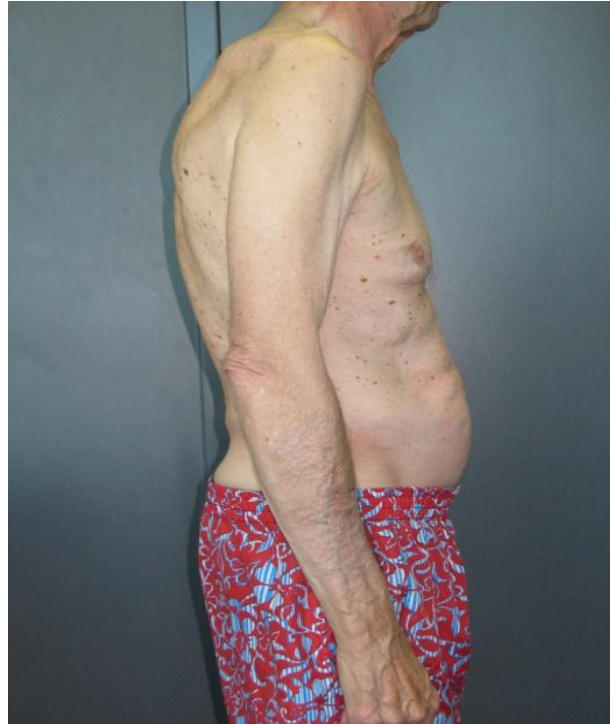


Training for sports & high performance events

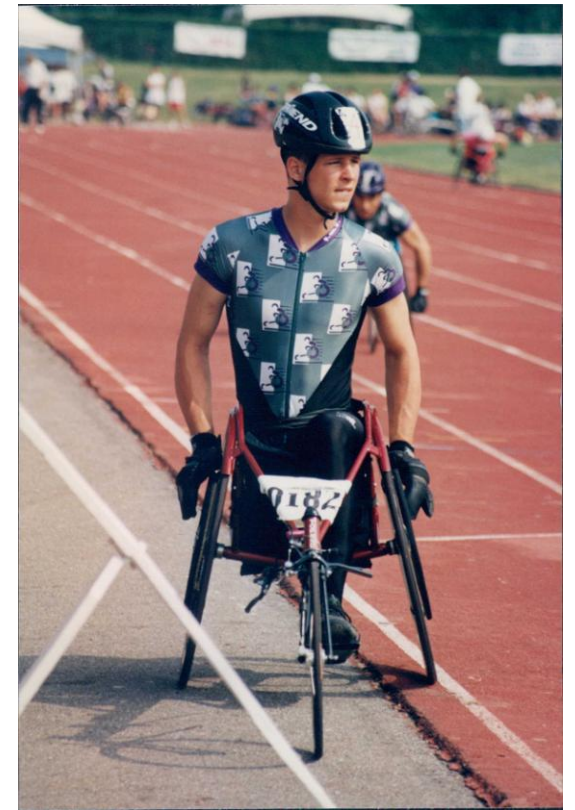
Disclaimer

The presentation provides general information and advice for transplant patients. For specific medical guidance relating to health issues, please talk to your doctor or members of your transplant team.

Make these bodies INTO...



These athletes!



Presentation Objectives

Present the important factors to consider in training for sport performance:

1. Muscle balance & movement impairments
2. Balance & coordination
3. Cardio-Respiratory system
4. Energy Systems required
5. Overtraining - SAID Principle

The Transplant Athlete

FACTORS TO CONSIDER:



1. Muscle Balance & Movement Impairments

Tonic muscles

The BULLIES!

Dominant in the
sedentary,
Deconditioned,
injury stricken,
older person.



Phasic Muscles

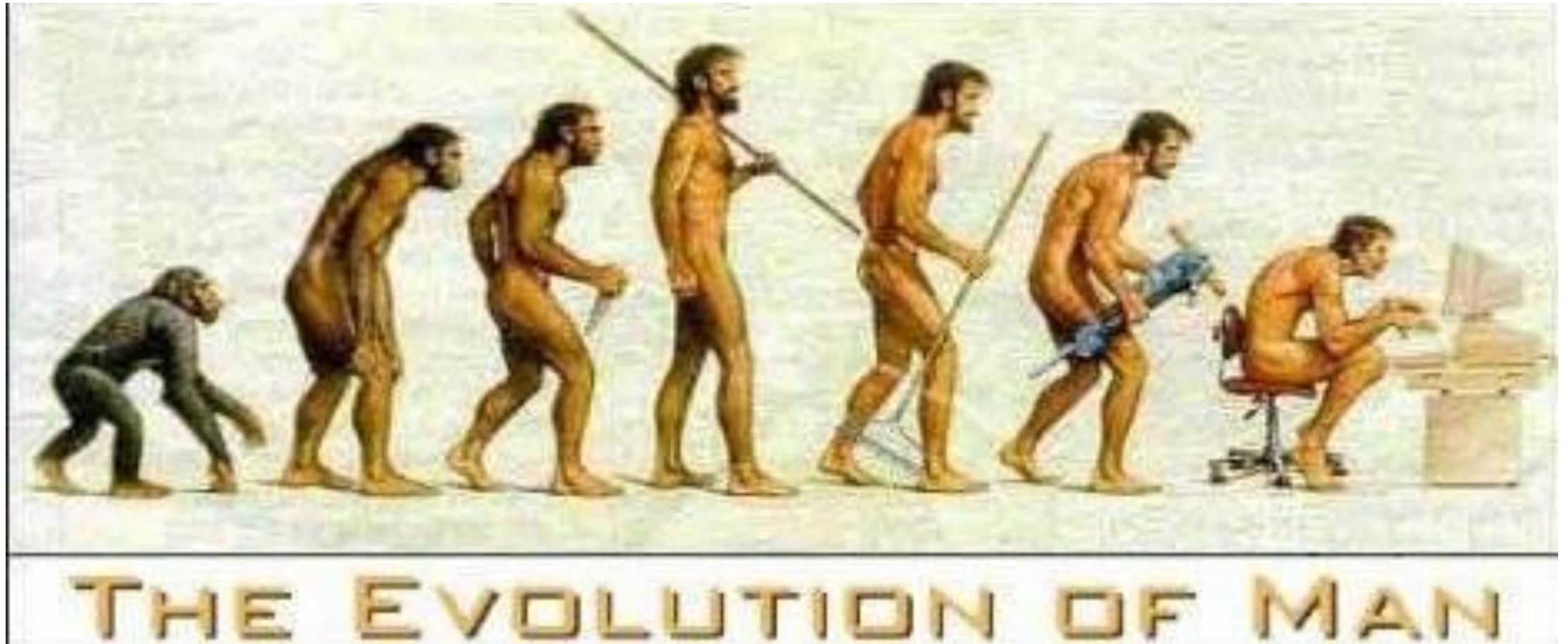
Do the anti-gravity
function

Easily inhibited –
use it or lose it!

Today's Head Position

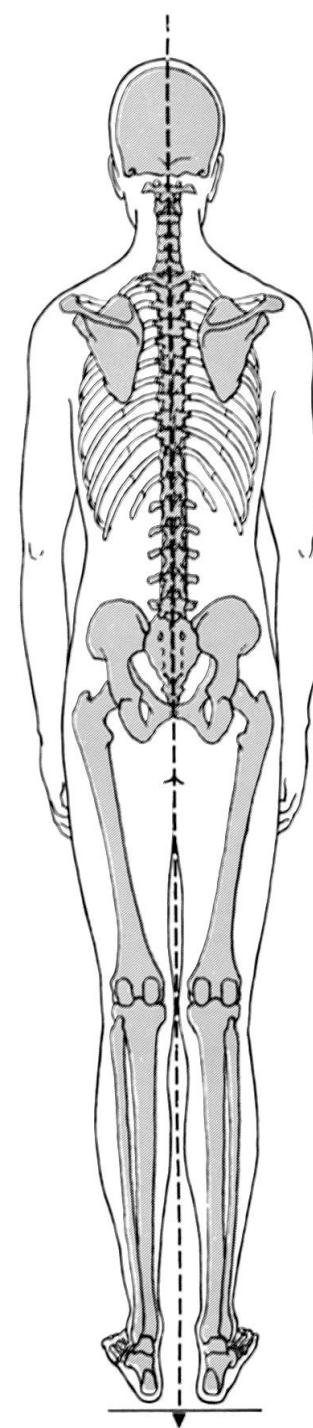


We're going in the direction that we used to be!



Proper Body Alignment

- protects joints from damage and overuse
- Aids in proper transmission of forces through the body

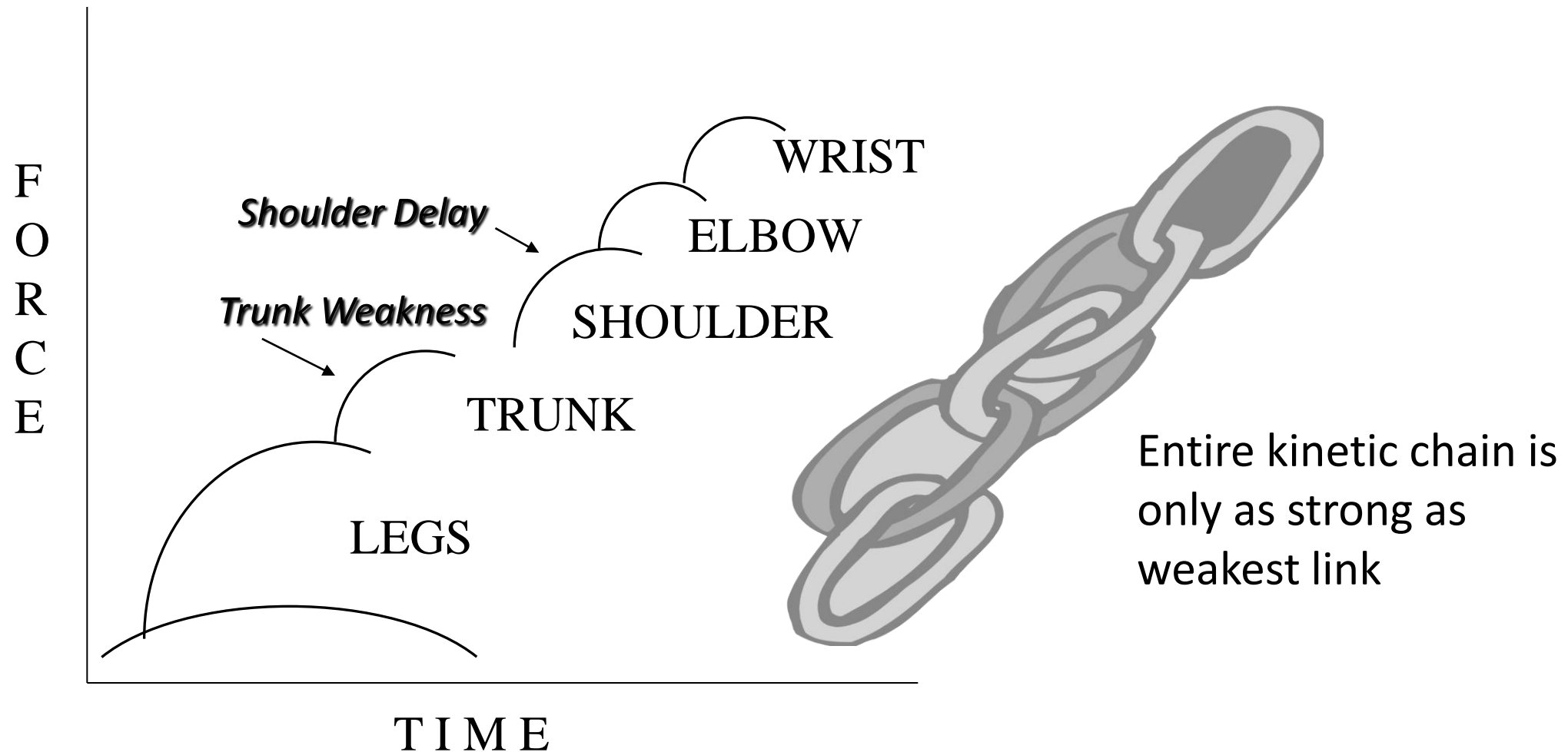


Functionally, muscles work together in slings, chains, and loops

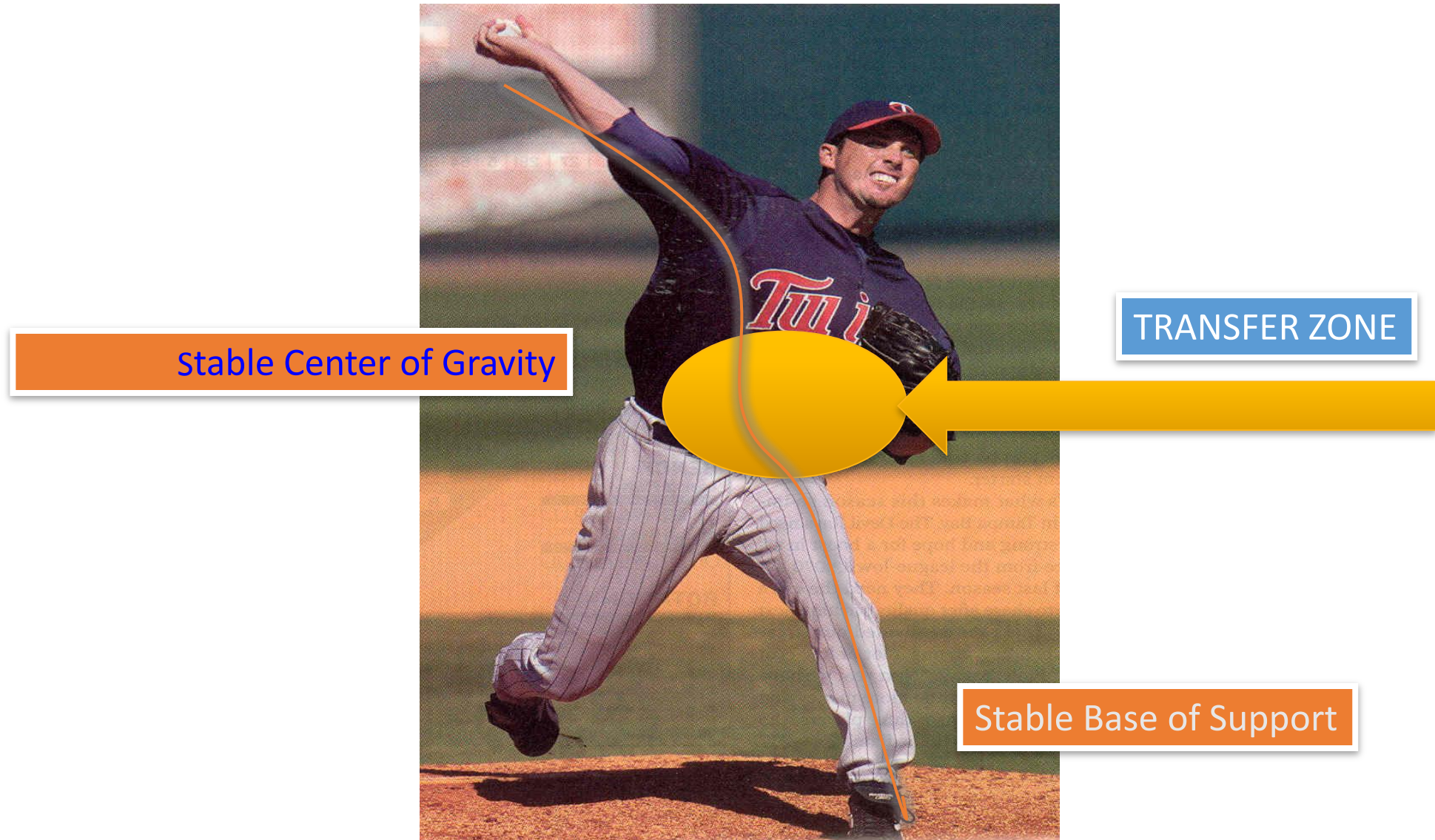


Muscles never work individually:
They disperse load among other joints.
Fascia is a key component.

Importance of Timing on force production

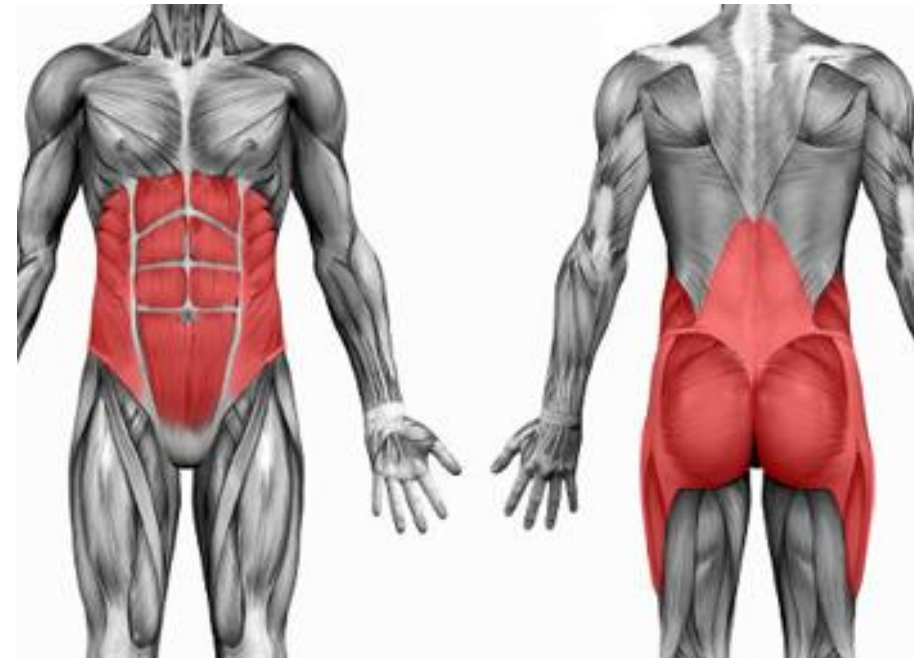


Movement requires stable origins (fixed points) for force generation & transmission



Proper Movement Patterning

- **Faulty movement patterns** result in breakdown over time.
- Treat/Strengthen the weakest link to facilitate the correct mms.
- Proper movement patterns will result.



2. Balance & Stability



Ability to maintain body's position over its base of support, whether base is stationary or moving



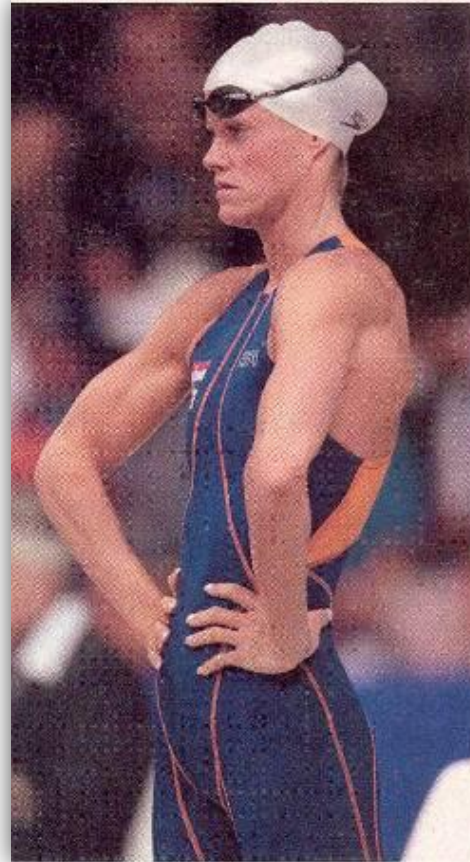
Stability – Structural vs Functional

Structural Stability:

Joint capsule & ligament congruency to optimize load

Functional Stability:

Active mechanisms locally & globally being activated by neuromuscular activation Reflex Driven



Don't focus on Weight Training!

Focus on:

Joint Flexibility

Developing the Core

Develop the stabilizers before
the prime movers

Train movements, not
individual muscles



Specific Functional Movement Tests

(based on Gray Cook's FMS & SFMA)



3. Cardio-Respiratory System

Dysfunction in Proper Breathing Patterns

Belly Breathing vs Chest Breathing

Primary Respiratory Mms – diaphragm & intercostals

Secondary Respiratory Mms – upper trapezius, scalenes, SCM, Levator scapulae, pectoralis minor

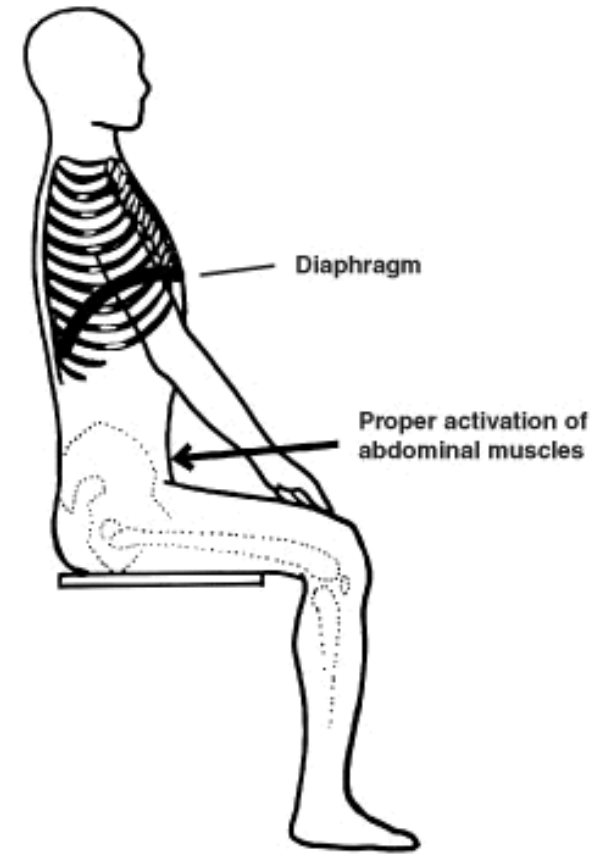
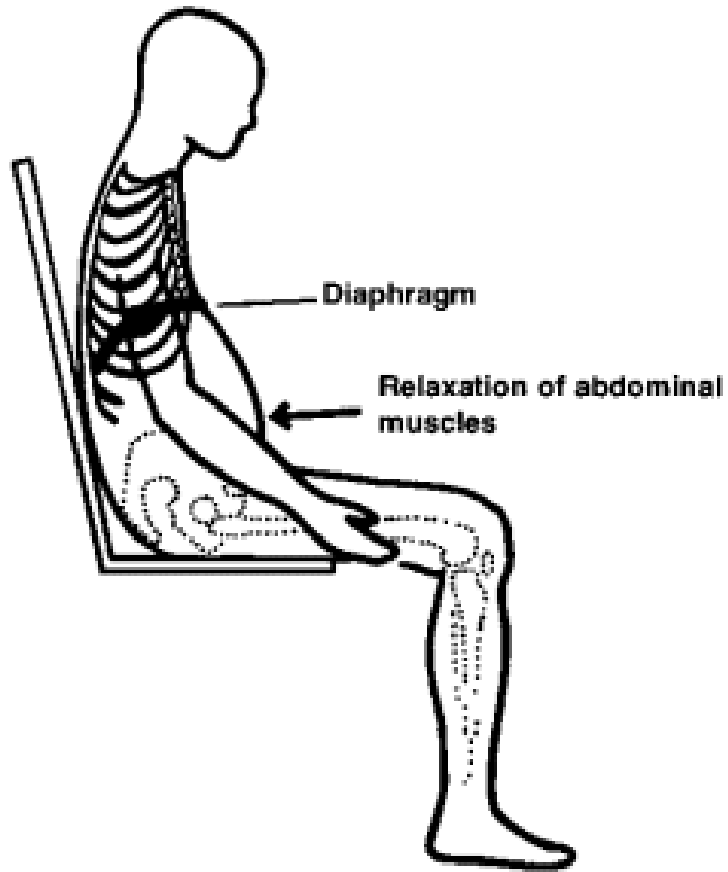
Affects not only mms, but head position, rib cage position & expansion

Leads to entire kinetic chain Pain & Dysfunction

Accessory Respiratory Muscles

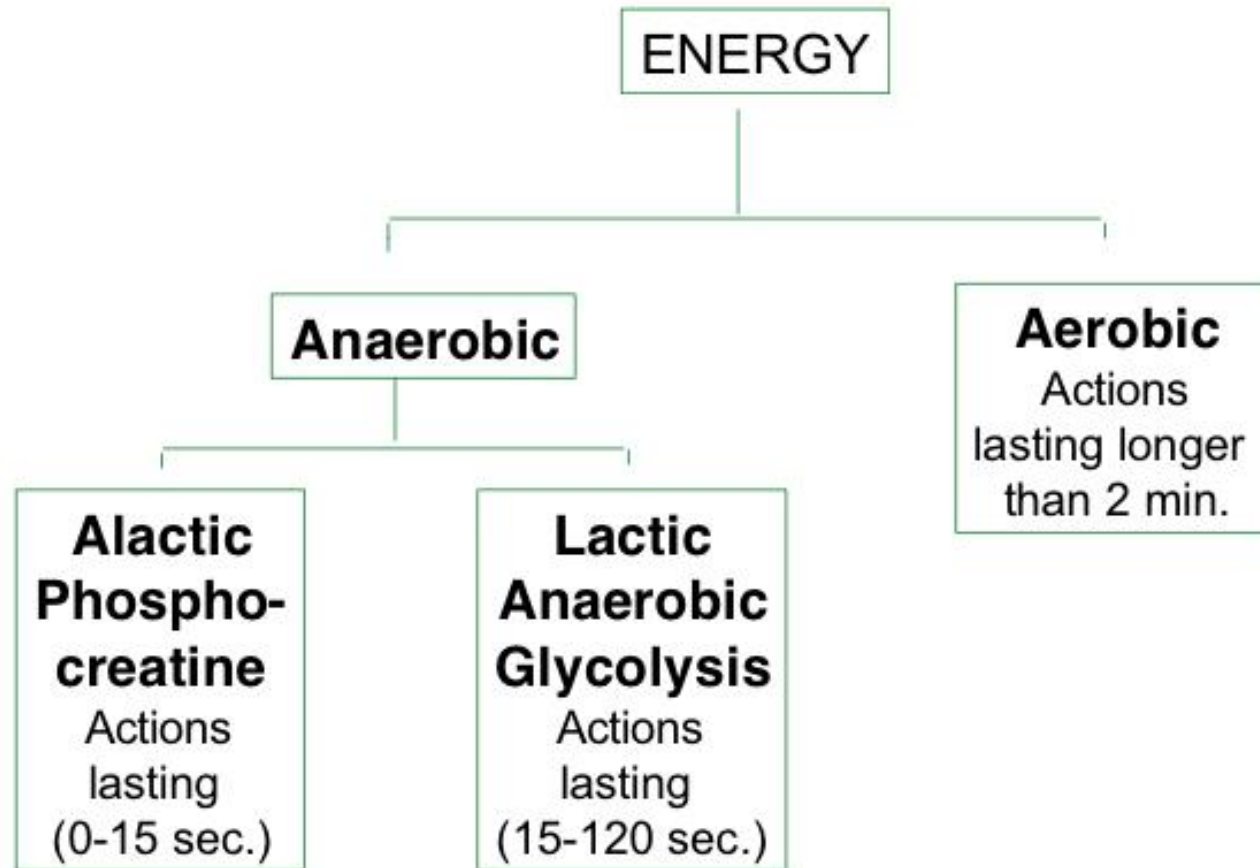


Dysfunctional Diaphragm it's effect on kinetic chain



4.

Energy systems



Progression of Energy Systems

Compared to
All-out sprint
Slower jog
Walking

ATP-PC system (anaerobic)
glycogen system (anaerobic)
aerobic system



Energy System Requirement for Specific Sports

ATP – PC System High Power & short duration

i.e. field event, short sprint, golf swing, release of bowling ball

Requires anaerobic system, fastest way to get your energy

Glycolytic System Mod power & short duration (from 30 sec – 2 min)

i.e. 400 m run, 200-400 m swim

Aerobic System Low power & long duration

i.e. triathlon, race walking, distance track events, distance swim, cycling

Combination anaerobic & aerobic systems

i.e. Tennis, badminton, table tennis

| Sport | ATP-PCr & Glycolysis | Glycolysis & Oxidative | Oxidative |
|---------------------------|----------------------|------------------------|-----------|
| Basketball | 60 | 20 | 20 |
| Fencing | 90 | 10 | 0 |
| Field Events | 90 | 10 | 0 |
| Golf swing | 95 | 5 | 0 |
| Gymnastics | 80 | 15 | 5 |
| Hockey | 50 | 20 | 30 |
| Rowing | 20 | 30 | 50 |
| Running (distance) | 10 | 20 | 70 |
| Skiing | 33 | 33 | 33 |
| Soccer | 50 | 20 | 30 |
| Swimming (distance) | 10 | 20 | 70 |
| Swimming (50m freestyle)* | 40 | 55 | 5 |
| Tennis | 70 | 20 | 10 |
| Volleyball | 80 | 5 | 15 |

Taken from Foss ML and Keteyian S. (1998) *The Physiological Basis of Exercise & Sport: 6th Edition.*


* Stager JM and Tanner DA. (2005) *Swimming: 2nd Edition.*

First Must Train the Aerobic System

- Must first build an aerobic base
- Positive dose response of health/fitness benefits results from increasing exercise intensity.
- Min. threshold of intensity for benefit varies depending on an individual's fitness, age, health status, genetics, & habitual physical activity.

First Must Train the Aerobic System

WHY?

- 
- CV health & fitness
 - CV efficiency (increase stroke volume, decrease HR & systolic BP sub-maximally)
 - VO2 max
 - Anaerobic threshold(s)
 - Oxygen uptake kinetics
 - Endurance performance
 - Recovery between repeated intervals
 - Caloric expenditure

How to Develop Aerobic Fitness

Should be done 30-60 minutes/day for 3-5 times/wk
-moderate-intensity aerobic exercise for min. of 30 min. 5 days/wk
OR
vigorous exercise for min. of 20 min. 3 days/week
(current recommendations ACSM)

Should consist of a warm-up, conditioning period (moderate intensity can accumulate the 30-minute minimum by performing bouts each lasting 10 mins or more), following by a cool down/stretching

Type/Volume/Progression

- Use large muscle groups & do rhythmic movement i.e. walking, elliptical, skating, bicycle
- Establish base with fitbit or pedometer, so can increase volume & intensity systematically
- Increase duration by 5-10 minutes per session every 1-2 weeks for first 4-6 wks
- If doing intervals, start with a 1:2 work:relief interval & progress to 1:1
- This process takes 12-16 weeks

Active Recovery



Recovery from high levels of lactic acid within the muscle has been shown to be aided by active rest during the recovery phase.

5. Overtraining Syndrome (OTS) also called 'burnout' or 'staleness'



Imbalance in Equation: $\text{Training} = \text{workout} + \text{recovery}$

Problems from Overtraining

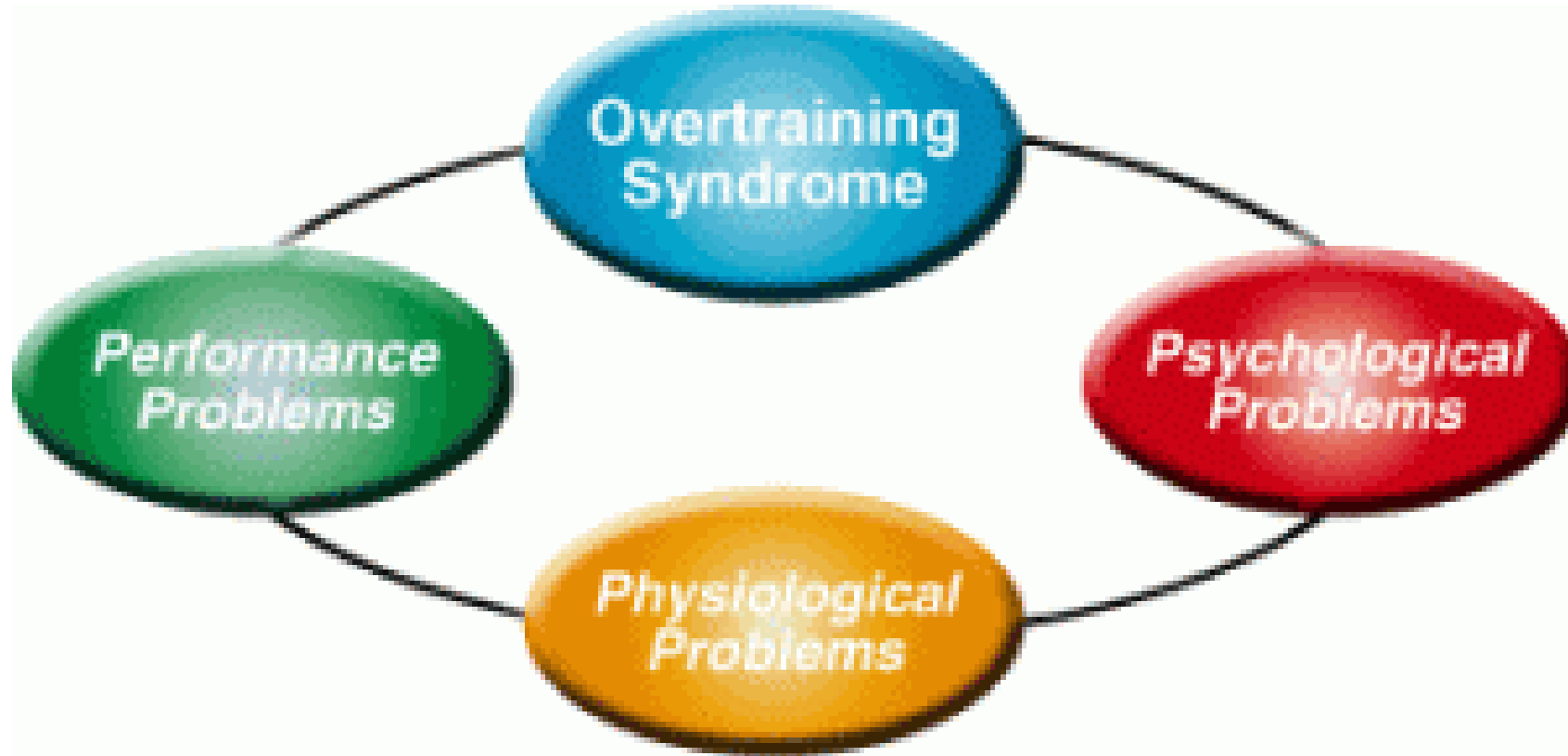


Fig 1: The major problems resulting from overtraining

Need to Monitor:

- Using a training Log
- Resting AM heart rate
- Resting AM weight
- General health
- Levels of muscle soreness
- Levels of fatigue
- Urine Acidity



SAID PRINCIPLE



Specific
Adaptation to
Imposed
Demand

When the body is placed under some form of stress, it starts to make adaptations that will allow the body to get better at withstanding that form of stress in the future.

General adaptation stages



Alarm stage

The stressor upsets
homeostasis or cellular balance



Resistance
stage

Body fights back by adjusting
to the stress



Exhaustion
stage

Rest permits enhanced
adaptation.
No rest = overtraining, injury,
lack of adaptation

Adaptation is Specific

Mechanical stress to bone, muscles, tendons & ligaments will result in thicker bones, bigger muscles, & stronger tendons & ligaments.

New motor skills will be learned as the neurons in your brain imprint new skills and coordination.

Limitations

1) The training stress must be the RIGHT AMOUNT.

Not too little – need sufficient stress to encourage body to build adaptations

Not too much – if the training is too stressful, then the body fails to recover and injury results

2) The training stress must be sufficiently specific to ensure 'transfer' or carryover' to the sport or activity

Basic Rule of Improving Performance:



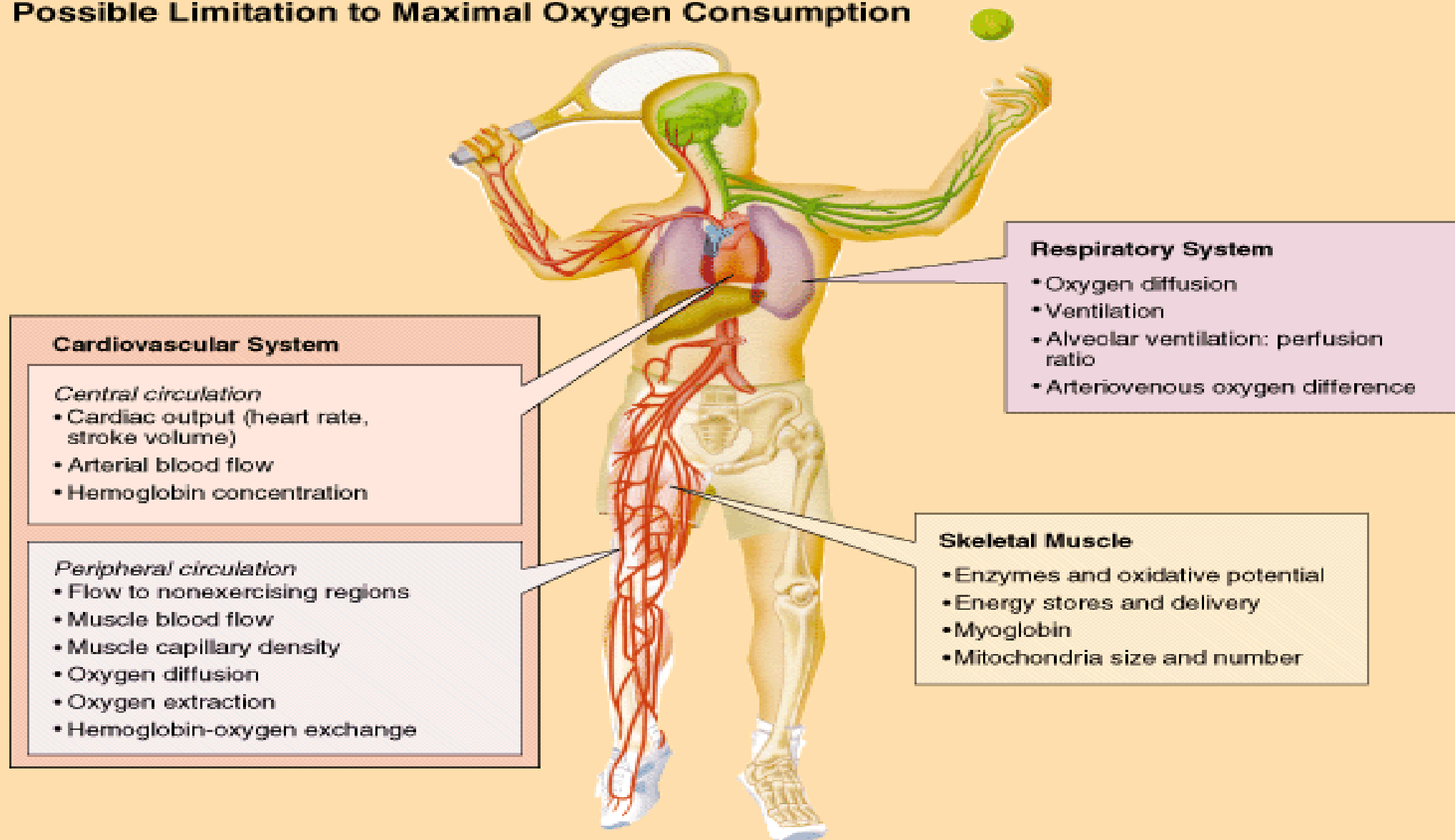
To keep progressing the level of difficulty of the training without getting hurt or overtired.

The Transplant Athlete

You must consider the same factors.

- The musculoskeletal system will need more 'tuning' depending on the starting baseline
- Training & recovery time will probably be longer.
- There will probably be a limitation on building the aerobic energy system.

► Possible Limitation to Maximal Oxygen Consumption



More Research Needed!

- Setting specific safe goals for training
- Progression of training
- Use of high intensity interval training
- Role of medication & how to alter it with athletes
- Use of resistance exercise
- How to better tap the oxidative energy system
- Increasing sensorymotor control
- ...

You don't have to be...



Kyle Garlett, post heart recipient,
completed the Ironman, 2010, 2011



Gift of Life dragonboat Team

Just Be Active!



Good Luck in TO in 2016!



Thank You

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