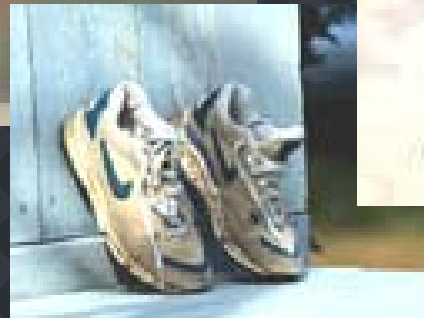
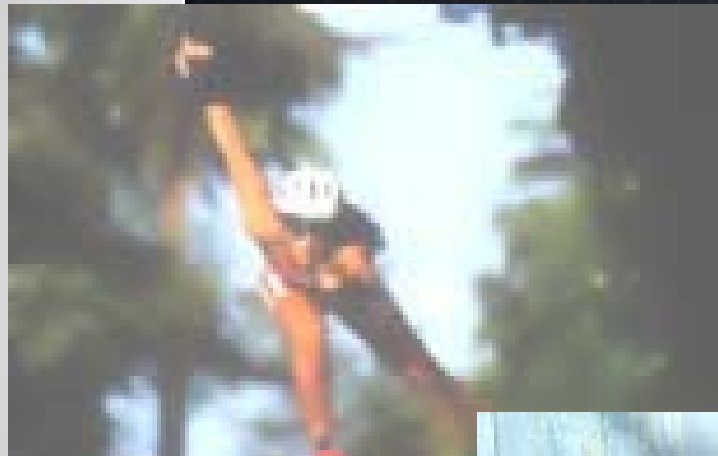


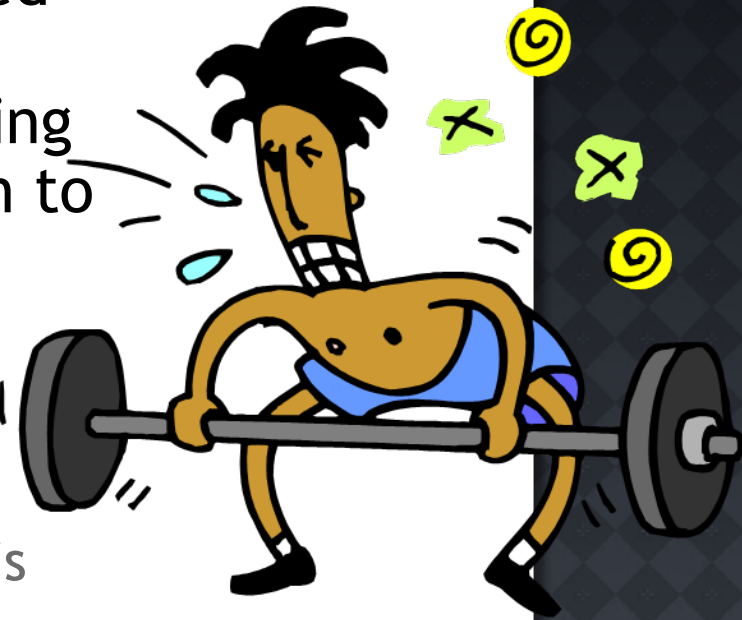
THE PHYSIOLOGY OF TRAINING



PRINCIPLES OF TRAINING

OVERLOAD

- A system or tissue must be exercised at a level beyond what it is accustomed to in order for a training effect to occur. Gradual adaptation to the overload takes place.
- The overload is achieved by manipulating combinations of the FITT principle:
 - Frequency - How often the exercise is done.
 - Intensity - How hard the exercise is done.
 - Time - How long the exercise is done.
 - Type - What exercise is being done.



PRINCIPLES OF TRAINING

SPECIFICITY

- The training effect is limited to the muscle fibers and the system being stressed.
- Specific exercise elicits specific adaptations, creating training effects.
- Eg:
 - Training the anaerobic system has little effect on the aerobic system.
 - Training for strength has little effect on the aerobic system
 - Training the legs has little effect on the arms.

PRINCIPLES OF TRAINING

INDIVIDUAL DIFFERENCES

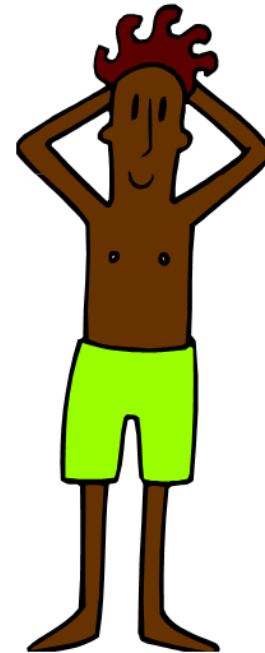
- Every person responds differently to training in a greater or lesser degree.
- Training benefits are optimized when programs are planned to meet the individual needs and capacities of the participants.



PRINCIPLES OF TRAINING

DETRAINING OR REVERSIBILITY

- ◉ When overload is stopped the training effect is gradually lost
- ◉ When workouts stop, are too far apart or are not stressful enough, performance may get worse.



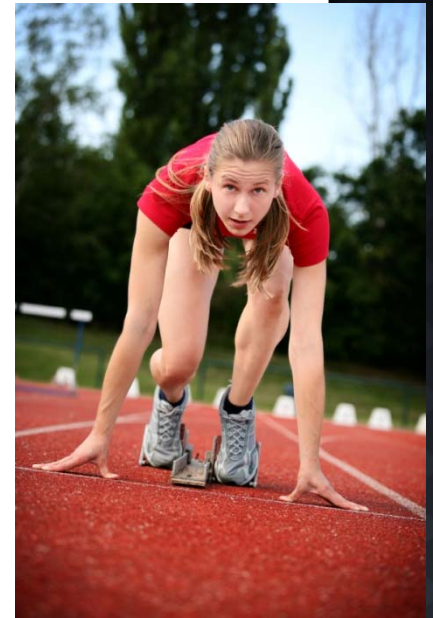
ANAEROBIC SYSTEM CHANGES WITH TRAINING

- ⦿ Increases in resting levels of ATP, CP, C and glycogen.
- ⦿ Increases in the quantity and activity of the key enzymes that controls the anaerobic phase of glucose breakdown.
- ⦿ Increases in the capacity for generating high levels of blood lactate as a result of increased levels of glycogen and “pain” tolerance and motivation

ANAEROBIC TRAINING

Anaerobic Alactic System

- ⦿ ATP-CP System
- ⦿ Type of training - Interval
- ⦿ Intensity - 100% of maximum work rate.
- ⦿ Work Time per rep - 5-10 seconds.
- ⦿ Work/Pause Ratio - 1:5 - 1:6
- ⦿ Set Volume - Max of 60 seconds.
- ⦿ Rest between sets - 3-10 minutes.
- ⦿ Session Volume - 2-8 minutes.
- ⦿ Sessions per week - max of 3.
- ⦿ Programs will be 8-12 weeks.
- ⦿ Use sport specific training.



ANAEROBIC TRAINING

Anaerobic Lactic System

- Type of training - Interval
- Intensity 85-100% of max HR (220-age)
- Work Time per rep - 10 secs to 2 mins
- Work/Pause Ration - 1:5 to 1:6
- Set Volume - Max of 3 minutes
- Rest between sets - 10-15 minutes
- Session Volume - 10-12 minutes.
- Sessions per week - max of 3.
- Programs will be 8-12 weeks.
- Use sport specific training.



AEROBIC SYSTEM CHANGES WITH TRAINING

◎ Metabolic Adaptations:

- Increased capacity to generate ATP because of increases in aerobic enzymes
- Increase in ability to use fats as a fuel source
- Increased ability to use carbohydrates as a fuel source.



AEROBIC SYSTEM CHANGES WITH TRAINING

- ◎ Cardiovascular and Respiratory adaptations
 - Increase in weight and volume of heart
 - Decrease in resting and submaximal heart rates.
 - Increase in heart stroke volume at rest and during exercise resulting in an increase in maximal cardiac output.
 - Increase in O₂ extraction from blood.
 - Reduction in both systolic and diastolic blood pressure at both rest and submaximal exercise.
 - Increase in breathing volumes
 - Increase in VO₂ max

AEROBIC TRAINING



- Type of training - Continuous
- Intensity 80-85% of max HR for interval
 - 60-80% of max HR for continuous
- Work Time per rep - 15 secs to 7 mins for interval
- Work/Pause Ration - 1:2 to 1:3 for interval
- Set Volume - 10-15 mins for interval
- Rest between sets - 10-15 minutes for interval
- Session Volume - 20-60 minutes for both.
- Sessions per week - 3-6
- Important as a base for anaerobic system



CHANGES FROM STRENGTH TRAINING

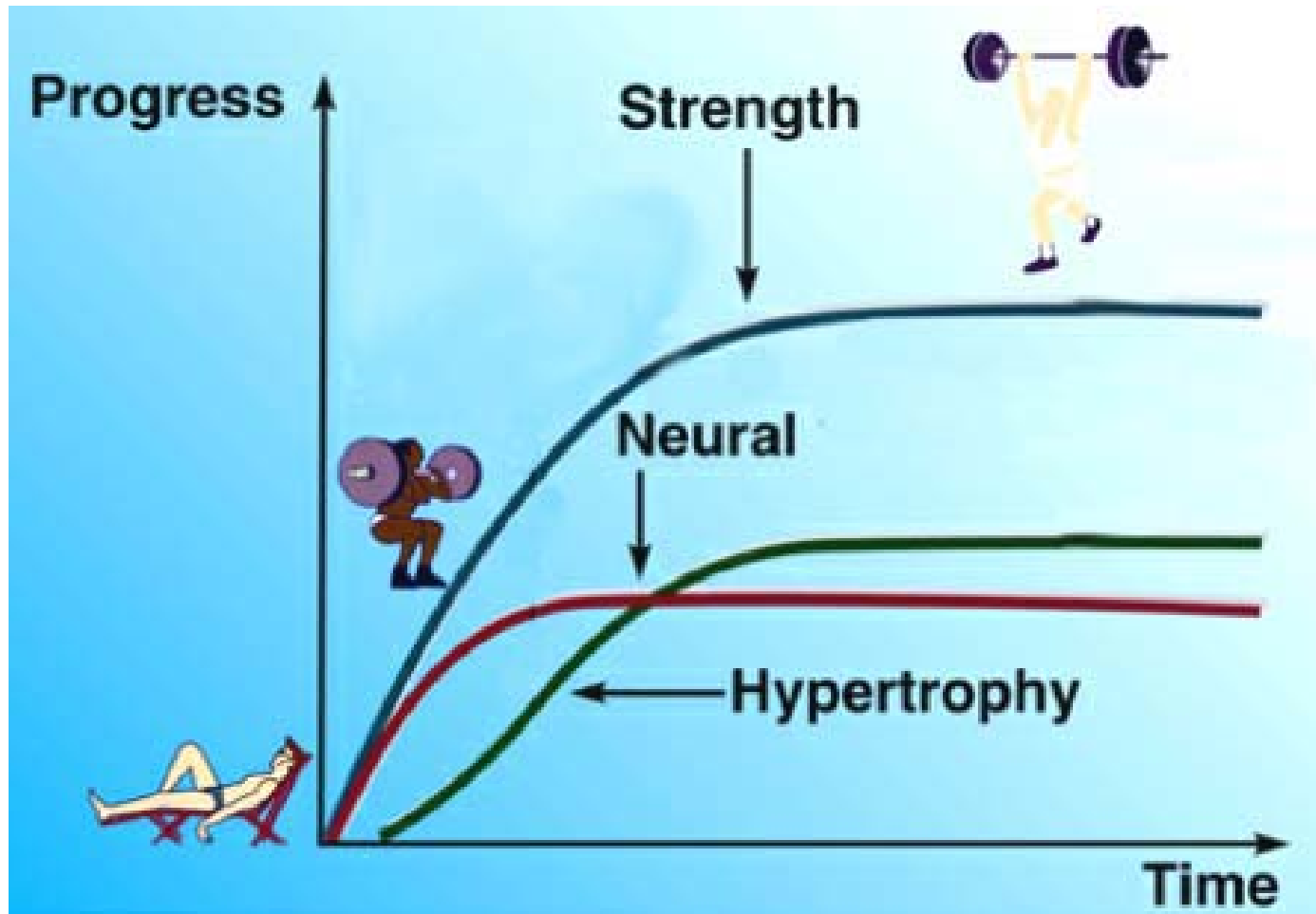
◎ Neural Changes:

- Recruitment of more motor units.
- Better synchronization of motor units.
- Happens early in training program.

◎ Increase in muscle size

- Hypertrophy - an increase in the cross sectional area of muscle fibers as a result of increase in the number of myofibrils.
- Hyperplasia - an increase in the number of muscle fibers.

NEURAL AND MUSCULAR ADAPTATIONS



STRENGTH TRAINING BASICS

- ◎ Use a progressive approach
- ◎ Do 2-3 workouts per week.
- ◎ Allow at least 48 hours between workouts for a specific muscle group.
- ◎ Vary the workouts - as often as every week
- ◎ Develop a muscular balance

BASIC PHASES OF STRENGTH TRAINING

1. Transition Phase

- ◎ Purpose - To help the body adjust to the demands of resistance training.
- ◎ Duration - 1 to 3 weeks.
- ◎ Workout: 2 to 3 sets of 12-15 reps
 - @55-65% of 1 rep max



BASIC PHASES OF STRENGTH TRAINING

2. Hypertrophy Phase

- ◎ Purpose - To increase the size of the muscle fibers.
- ◎ Duration - 2 to 4 weeks.
- ◎ Workout: 3-6 sets of 9-12 reps
 - @ 75-80% of 1 rep max



BASIC PHASES OF STRENGTH TRAINING

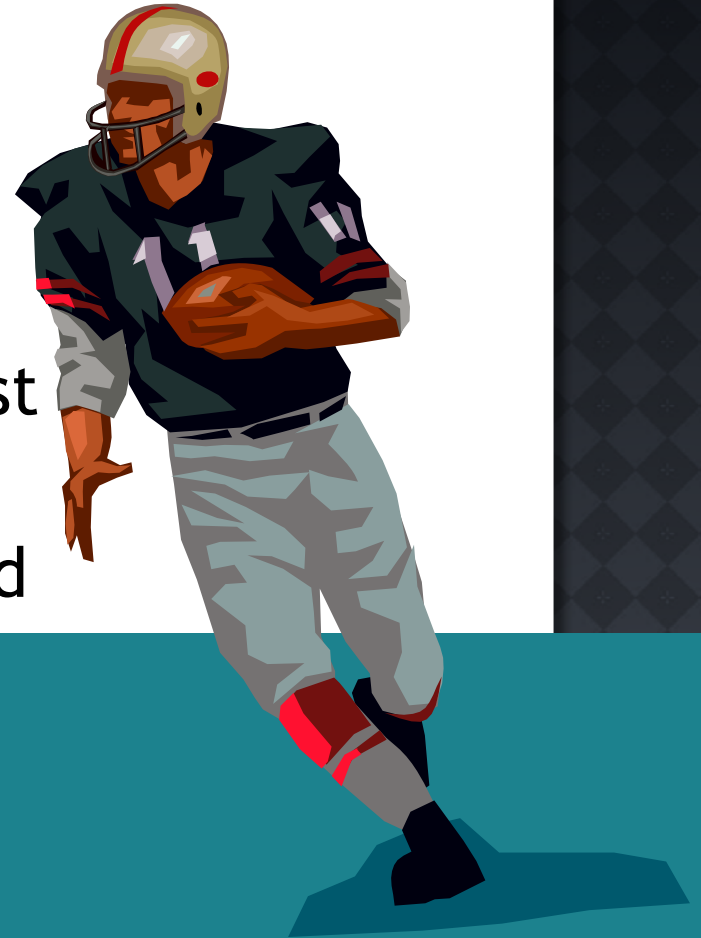
3. Strength Phase

- ◉ Purpose - neuromuscular adaptations.
- ◉ Duration - 2-4 weeks.
- ◉ Workout: 4 to 8 sets of 1-5 reps
 - ◉ @85-100% of 1 rep max



POWER TRAINING

- ◎ Power is a combination of strength and speed
- ◎ Most sporting activities demand high levels of power and not just strength.
- ◎ Strength levels can be improved by 300-500% but speed can only be improved by 10-20%.
- ◎ Good strength levels should be reached before heavy power training is done.



POWER TRAINING

Resistance Exercises

- ◎ Purpose - neuromuscular adaptations directed at improving the speed of movement.
- ◎ Duration - 2-3 weeks.
- ◎ Workout: 3 to 5 sets of 6-10 reps @ maximum speed

POWER TRAINING

Plyometrics

- ◎ The muscle is stretched immediately prior to contraction, making use of the stretch reflex to increase the muscular force
- ◎ Examples: hopping, skipping, bounding and depth jumps
- ◎ Should only be done after high strength levels have been reached as it is very demanding on the body
- ◎ Should be done on soft surfaces such as mats or soft ground
- ◎ Workout: 1 to 3 sets of 10-12 reps with at least 2 days rest between workouts

OTHER STRENGTH TRAINING METHODS

Isometric Exercises

- ⦿ Can result in both muscle hypertrophy and increase in strength.
- ⦿ Strength gains are primarily developed at specific muscle length or joint angle of the training
- ⦿ Sometimes used in recovery from injuries causing a loss of strength at specific angles

OTHER STRENGTH TRAINING METHODS

Isokinetic Devices

- ◎ Based on muscle producing maximum force throughout the full range of motion
- ◎ The speed is controlled usually by hydraulic cylinders (eg: HydraGym)
- ◎ No eccentric contractions are possible

A BASIC STRENGTH TRAINING PROGRAM

- ◎ 1. Transition Phase - 1-3 Weeks
- ◎ 2. Hypertrophy - 2-4 weeks
- ◎ 3. Strength - 2-4 weeks
- ◎ Rotate between steps 2 and 3 using progression and variety
- ◎ Consider power prior to critical performances
- ◎ Set aside some time each year for periods of rest during with only maintenance workouts are done.

FLEXIBILITY

Range of Motion about a Joint

- ⦿ Specific to the individual.
- ⦿ Specific to the joint.
- ⦿ Limited by muscles, tendons, joint capsule, ligaments and bones of the joint.
- ⦿ Can usually be increased by stretching the muscles and tendons acting around the joint.



FLEXIBILITY TRAINING

Passive Static Stretching

1. Athlete begins in neutral starting position
2. Athlete moves body part to its maximum range of motion to a point where the muscle can be felt but there is no pain.
3. This position is held for 10-60 seconds during which time the athlete must consciously try to relax the muscles.
4. The starting position is returned to and then the sequence is repeated 2 or 3 times.

FLEXIBILITY TRAINING

Active Static Stretching

1. Athlete begins in neutral starting position
2. Athlete moves body part as far as possible.
3. The body part is then pushed beyond this range of motion either by the athlete or a partner until the muscle tension can be felt but there is no pain.
4. The body part is held at this maximum range for 15-20 seconds during which time the athlete is consciously trying to relax.
5. The starting position is returned to and then the sequence is repeated 2 or 3 times per muscle group.

Active Static Stretching increases ROM better than passive static stretching

FLEXIBILITY TRAINING

PNF Stretching

1. Athlete begins in neutral starting position.
2. Athlete moves body part as far as possible
3. The body part is then pushed beyond this range of motion either by the athlete or a partner until the muscle tension can be felt but there is no pain.
4. The partner holds the body part at the maximum range of motion

continued on next page...

FLEXIBILITY TRAINING

PNF Stretching

5. The athlete actively contracts the muscle group against the partner's resistance for 5-6 seconds.
6. The athlete then relaxes the muscle group as the partner gently pushes the joint to a greater range of motion until a new stretch is felt. Athlete may also actively contract the antagonist muscle group.
7. The sequence is repeated 3 times per muscle group

WORKOUT BASICS

- ◎ Complete a warm-up before beginning.
 1. Raise body temp. (close to a light sweat)
 2. stretch
- ◎ Order of exercises (3 methods)
 1. Large muscles first
 2. Alternating with antagonistic groups
 3. Alternating upper body and lower body
- ◎ Ensure adequate rest between each set to allow complete recovery 2-5 mins. Average
- ◎ Ideally all sets for one exercise should be done before moving on to the next exercise

WORKOUT BASICS

- ⦿ To save time consider using mini cycles of 2 or 3 exercises of different muscle groups
- ⦿ Encourage athletes to work with a partner
- ⦿ Train athletes on the proper lifting techniques especially when using free weights.
- ⦿ Ensure that all equipment is in a good state of repair before each workout.