Exercise Principles & Programming

Learning Objectives

- Introduce basic exercise principles and program design concepts
- Discuss the body's adaptations to regular exercise
- Learn how to establish exercise training intensity ranges
- Understand the components of an effective exercise program

Basic Exercise Principles

- S.A.I.D. Principle
- Overload
- Progression
- F.I.T.T. Principle
- Rest & Recovery
- Detraining

S.A.I.D. Principle

- “Specific Adaptation to Imposed Demand”

- Must train for the activity that is to be performed
  - Training for the bench press will not improve your 1.5 mile run time
  - A great cyclist may not be a great runner

Overload

- Greater than normal stress or load on the body is required for training adaptations to occur

- These adaptations lead to increased performance in strength, speed, endurance, etc.

Progression

- Periodically increasing the training load in order for improvements to continue over time

- For program progressions allow for:
  - Initial conditioning phase of 4-6 weeks
  - Improvement phase of 4-5 months
  - Maintenance thereafter

Progression Rule

- Do not ↑ by more than 10% per week:
  - Running (i.e. mileage)
  - Cardio Machine (i.e. time)
  - Strength Training (i.e. weight)

- Higher increases are associated with:
  - Injury
  - Overtraining

F.I.T.T. Principle

- Used to develop an exercise prescription
  - Frequency
  - Intensity
  - Time
  - Type

- Each variable can be modified to promote overload and allow for progression

Frequency

- Number of training sessions conducted per day or per week

Intensity

- Effort expended during a training session:
  - Effects both frequency and duration of training
- Can be measured via:
  - Heart Rate (Target HR)
  - Rate of Perceived Exertion (RPE)
  - Talk Test

Exercise Intensity: Calculating Target Heart Rate

- Heart Rate Reserve (HRR) Formula (Karvonen Method)
  - Uses Resting Heart Rate (RHR)
- To determine Training Heart Rate Range (THRR):
  - 60-75% MHR for endurance
  - 80-95% MHR for high intensity

DIAGRAM SHEET 1-7-1

CALCULATING TARGET HEART RATE ZONE WORKSHEET

Heart Rate Reserve Formula (Karvonen Method)

Target Heart Rate (THR) - Low End	Target Heart Rate (THR) - High End
Step 1: 220 - _____ = _____ (Age) (APMHR)	Step 1: 220 - _____ = _____ (Age) (APMHR)
Step 2: _____ - _____ = _____ (APMHR) (RHR) (HRR)	Step 2: _____ - _____ = _____ (APMHR) (RHR) (HRR)
Step 3: _____ x _____ + _____ = _____ (HRR) (Exer. Intensity) (RHR) (THR)	Step 4: _____ x _____ + _____ = _____ (HRR) (Exer. Intensity) (RHR) (THR)

Example: 30 year old male, RHR of 60 bpm, desired exercise intensity range of 60-75% APMHR

STEP 1: 220 – 30 = 190

STEP 2: 190 – 60 = 130

STEP 3: (130 x 0.60) + 60 = 138

STEP 4: (130 x 0.75) + 60 = 158

Target Heart Rate Range (THRR) = 138 – 158 bpm

Resting Heart Rate (RHR)

Your resting heart rate (RHR) is the number of times the heart beats per minute (bpm) at rest. The best time to take your RHR is in the morning when you wake up.

To take your radial heart rate, place your index and middle finger on the pulse at your wrist. To take your carotid pulse, place your fingers (not your thumb) on the side of the larynx (Adam's apple) until you find the pulse. Take the pulse by counting the beats for 10 seconds. Multiply that number by 6 to get bpm.

Take your RHR for three consecutive days to get your average bpm (i.e., add all three values together then divide by 3). For example: (60 + 64 + 68) ÷ 3 = 64 bpm.

RPE Chart, Talk Test, & %MHR

RPE Chart		Talk Test	%MHR
1	**Very Light Activity** Watching TV, riding in a car, etc.		
2-3	**Light Activity** Feels like you can maintain for hours	Breathing is easy, can sing	
4-6	**Moderate Activity** Feels like you can exercise for hours	Can carry a conversation	**52-66**
7-8	**Vigorous Activity** On the verge of becoming uncomfortable	Short of breath, can speak a sentence or two	**61-85** **86-91**
9	**Very Hard Activity** Very difficult to maintain exercise intensity	Can only speak one word at a time	**92**
10	**Maximum Effort Activity** Feels almost impossible to keep going	Completely out of breath, unable to talk	

Time

- Length of time the training session is conducted

ACSM Guidelines

Cardio-respiratory exercises:
Moderate intensity: 5+ days per week **OR**
Vigorous intensity: 3+ days per week **OR**
Combination moderate/vigorous: 3-5 days per week
AND
Resistance exercises 2-3 days a week
AND
Flexibility exercises at least 2 or 3 days a week
AND
Neuromotor exercise at least 2 or 3 days a week, involving motor skills such as balance, agility, coordination, and gait

Aerobic vs. Anaerobic

- The aerobic energy system is used for long duration activities
  - Requires oxygen to produce energy
  - Example: jogging, cycling

- The anaerobic energy system is used for short duration, high intensity activities
  - Because intensity is so high, the body cannot fuel this activity with oxygen alone and energy can only be supplied for a short duration
  - Example: sprinting

Example Activities

- Moderate:
  - Brisk walking
  - Water aerobics
  - Riding a bike on level ground or with few hills
  - Playing doubles tennis
  - Pushing a lawn mower
- Vigorous:
  - Jogging or running
  - Swimming laps
  - Riding a bike fast or on hills
  - Playing singles tennis
  - Playing basketball

Type

- Specific activity performed
  - Swimming
  - Cycling
  - Running

Program Selection

- The ideal exercise program incorporates several different types of physical activity:
  - Cardio-respiratory
  - Muscular Strength & Endurance
  - Flexibility
  - Balance / Agility

Cardio-respiratory Fitness

- The ability of the body to uptake, transport, and utilize oxygen to working muscles during sustained exercise

Cardio-respiratory Training

- Benefits associated with cardio-respiratory training
  - ↓ blood pressure
  - ↓ blood cholesterol
  - ↓ risk for disease
  - ↑ cardiac function/efficiency
  - ↑ life expectancy

Muscular Strength & Endurance

- Muscular Strength
  - The maximum amount of force that a muscle can exert against some form of resistance in a single effort
- Muscular Endurance
  - The ability of a muscle (or muscle group) to do repeated contractions against a less-than-maximum resistance for a given period of time

Strength Training

- Benefits of strength training:
  - ↑ cardiac function/efficiency
  - ↑ bone mineral density
  - ↓ risk of injury
  - ↑ joint flexibility/range of motion
  - ↑ tolerance to job related activities:
    - Lifting
    - Pulling
    - Pushing
    - Carrying

Exercise Technique

- Proper exercise technique is critical to:
  - Reduce risk of injury
  - Prevent “energy leaks”
  - Reduce effort to perform task when needed (i.e., PRT)
  - Improves exercise effectiveness

Flexibility

- The ability of a joint to move freely through its full range of motion

Benefits of Flexibility Training

- Enhances performance
- Improves circulation
- Improves posture
- Improves muscle coordination

Balance and Agility

- Ability to change direction quickly and safely
- Can be trained for and developed
- Improves performance and reduces risk for injury
- Examples
  - Single leg exercises
  - Movements that involve direction and acceleration changes

Rest and Recovery

- One of the most important, but commonly overlooked, principles of exercise
- Adequate rest:
  - Replenishes energy stores
  - Repairs damaged tissues
  - Prevents overtraining
- Some activities require up to 48-72 hrs
  - High intensity strength training

Active Recovery

- The process of recovering using low-intensity activity
- Active recovery helps to:
  - Rid muscles of lactic acid
  - Reduce residual muscle soreness and fatigue

Symptoms of Overtraining

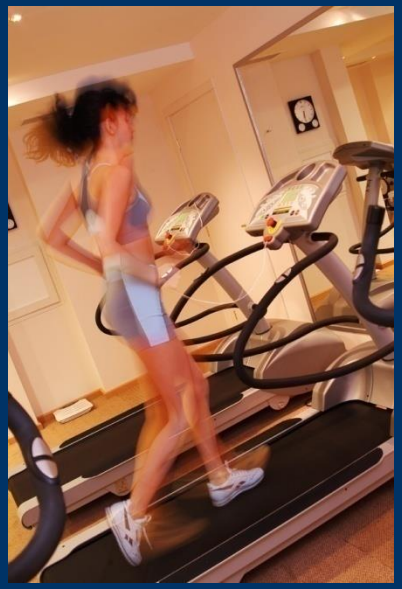
- Fatigue
- Prolonged soreness
- Irritability
- Sleep disturbances
- Lack of motivation / boredom
- Rapid heart rate
- Constant or reoccurring pain
- Lack of progress

Overtraining Prevention

- Avoid workouts that cause prolonged muscle soreness (i.e., 48 hours or more)
- Progress Gradually
  - Do not manipulate more than 2 F.I.T.T. principles at any one time
  - Small increments every 2 weeks

Cross-Training

- Use different types of training to:
  - Maintain general conditioning
  - Reduce injuries associated with overtraining
  - Prevent boredom / monotony



Detraining

- “Use it or lose it”
- Extent of detraining depends on:
  - How fit you are
  - How long you have been exercising
  - How long you stopped exercising

Summary

- Reviewed some basic exercise terminology
- Learned how to determine exercise intensity by using RPE and heart rate
- Discussed exercise program components and how they can be incorporated to help meet individual fitness goals
- Reviewed mechanisms for injury prevention

References

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Questions?