CARDIORESPIRATORY ENDURANCE

Is a component of Personal Fitness
Cardiorespiratory Endurance,
Muscular Strength and Endurance,
Flexibility and
Body Composition

Ultimate Home Tri-Simulator
Aerobic Exercise

- Relatively low or moderate intensity (55%-85% of Max HR)
- Using big muscle groups
- Continues, non-stop
- Rhythmical
- 20 min. minimum length
- 3-5 times a week
HEART RATE MONITOR USE

3 parts:
Transmitter
Elastic strap
Receiver
HEART DIAGRAM

Superior vena cava

Aortic arch

Right pulmonary arteries

Left pulmonary arteries

Left pulmonary veins

Right Atrium

Left atrium

Atrioventricular valve

Right ventricle

Left Ventricle

Inferior vena cava

Descending aorta
HEART RATE

How many times a heart beats in 1 min.
(bpm) Frequency of cardiac cycle.
Controlled by the autonomic nervous system and adrenalin. (No direct control)

Body can increase the HR in response to different stressors:

1. Exercise
2. Environment
3. Psychological stress
HEART RATE - Terminology

- Resting HR
- Maximum HR
- Target HR
RESTING HR – How many times heart pumps the blood into your body in 1 minute when body and mind at rest.

Average 72 beats per min

- Highly individual
- Lower if person is fit (cardiovascular endurance conditioned)
- Extreme endurance athletes – as low as 30-40 beats per min
HR – Highly Individual

30-40 bpm

72 bpm

Gaussian or "normal" distribution

.0214

.00135

30-40 bpm over 100 bpm
HEART RATE - Maximum HR

MAXIMUM HR - How many times heart pumps the blood into your system in 1 minute during maximum intensity exercise

The most accurate way of determining individual $HR_{max}$ is a maximal exercise test.
HEART RATE - Maximum HR

- Individual, genetically determined
- Different for every activity, depends on muscles used during exercise
- Declines slightly with increased fitness level
- Declines with age
- Is the best index to set an individual training zones – Target HR
Determining $HR_{\text{max}}$

$HR_{\text{max}}$ Test

Gradually increase an exercise intensity until unable to continue (until total exhaustion)

According to ACSM men over age 40 and women over age 50, should have a medical examination before starting a vigorous exercise program.
Predicting $HR_{\text{max}}$

1. $HR_{\text{max}} = 220 - \text{age}$
   
   *easy remember, not accurate* (relatively accurate for only 13% of population)

2. $HR_{\text{max}} = 210 - \frac{1}{2} \text{age}$

3. $HR_{\text{max}} = 220 - \text{age}$

$HR_{\text{Reserves}} = HR_{\text{max}} - HR_{\text{rest}}$ (Karvonen)

Intensity = \% x HRR + HRrest

**Absence of true measure of HRmax!!!**
Target HR

- Is desired range of HR during exercise
- HR is an excellent indicator of cardiovascular exercise intensity
- HR is not a good indicator of intensity of strength training and flexibility
Determining Target HR (Exercise Intensity)

Intensity during exercise = % $\times HR_{Max}$

To improve cardiovascular endurance of unfit person:

Target HR should be 60-90% $HR_{Max}$

For minimum of 20 min (according to ACSM), 3-5 times a week
Target HR

Intensity during exercise = 60-90% x HR_{Max}

- Example: 16 years old person
  
  \[
  \text{HR}_{\text{Max}} = 220 - 16 = 204
  \]
  
  60% \quad 204 \times 0.60 = 122 \text{ bpm}
  
  90% \quad 204 \times 0.90 = 183 \text{ bpm}

  Target HR during endurance exercise should be between 122 – 183 bpm
As age increases, maximum attainable heart rate decreases, thus affecting the upper and lower levels of the target heart-rate zone.
Target HR

Heart rate during a typical aerobic exercise session
Aerobic workout (running)
Aerobic workout (bicycling)
HEART / HEART RATE EXERCISE ADAPTATIONS: (benefits of exercise)

1. **BIGGER, STRONGER HEART** left side pumps more blood into your body in one beat (Resting SV Stroke Volume 70 ml – Cardiac Output in one min 5 l)

![Diagram](image-url)
2. MORE EFFICIENT HEART resting heart rate decrease as low as below 40 beat per minute, lower MHR

3. EXTRA BLOOD VESSELS (capillaries multiply) in skeletal and heart muscle aerobic exercise – develop your “piping” – important part of preseason conditioning
How is cardiovascular fitness important to good health?

- helps lower body fat,
- reduces risk of heart disease and stroke,
- reduces risk of some types of cancer,
- helps keep blood pressure in a healthy range,
- reduces risk of osteoporosis
- reduces risk of diabetes, and
- helps you to enjoy activity without fatigue.