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Bio 9G: Spring 2007
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Lecture 9

Outline
1. Stroke volume extrinsic factors – hormones
2. Stroke volume extrinsic factors – reduced venous compliance
3. Effects of exercise
   1. purpose of blood
   2. cardiovascular center
   3. on cardiac output
   4. on blood vessels
4. Effect of aerobic training

Keys: SNS = Sympathetic Nervous System
      PNS = Parasympathetic

1. Extrinsic factors – stroke volume

Cardiovascular center starts exercise response:

2. Stroke volume extrinsic factors – reduced venous compliance

   - more nerve firing to arterioles

   $\xrightarrow{SNS} \downarrow$ compliance in veins
   $\Rightarrow \uparrow$ venous return

3. Effects of Exercise:
   Purpose of blood:
   $\uparrow$ food – glucose + fatty acids
   $\uparrow$ metabolism – $O_2 +$ energy from food
   $\uparrow$ waste removal – $CO_2 +$ Urea

Sympathetic nerve
Adrenal gland
Epinephrine in blood
Kidney

Cardiovascular system
Sympathetic
Parasympathetic
Sympathetic
Effect of exercise on cardiac output:

- PNS slows HR, exercise suppresses it.
- Venous return - skeletal pump; SNS on vasoconstriction (squeezing of bld vessels)
- SA node rate - ↓ PNS & ↑ SNS
- SNS - ↓ HR, ↑ contraction strength, ↓ venous vasoconstriction
- Force of contraction - ↑ Frank-Starling Law (EDV from ↑ venous return)

SNS = ↑ constriction (off blood, even to skin)

- Tempt regulation - skin open & sweat
- Brain 2 SNS systems:
  - 1st SNS ↑ vasoconstriction
  - Spinal cord
  - 2nd SNS Skin - ↑ skin arterioles vasoconstriction
- Heart stroke - not hydrated enuff, no blood to brain to cool down

Effect of exercise on blood vessels:

- Arterioles can turn off blood to all organs.
- SNS nerves to arterioles, shots down blood to muscle - (defaul action)
- SNS ↑ arterioles close

- Muscles → CO₂ + lactic acids → open arterioles
  (local factors @ muscles)
In-class work:
- cardiac output concept map

Keys:
- \( \Theta \) 
- \( \Theta \)

Acetylcholine

Cardiac Output

HR Rate

SA node Rate

Epinephrine

Norepinephrine (neurotransmitters)

SNS

Vein Compliance

Vein Return

Contractile Strength

S V Strk. Vol

EDV

Frank-Starling Law

Other good stuffs: crank, cocaine, methamphetamine, Mary Jane, angel dust, steroids

HEROINE...

Things that affect cardiac OUTPUT

Hw: do a concept map for effects of exercise on cardiac system.