

## Learning and Exercise

- 1) **Cannot learn *difficult* material during strenuous exercise**
  - Exercisers at 70-80% max HR on stationary bikes did poorly on tasks requiring complex learning. P53-4
- 2) **Moderate levels of aerobic activity increase executive function**
  - Japanese study: 30 minutes of jogging 2-3 times a week for 12 weeks improved executive function
- 2) **Exercise immediately preceding tests improved scores**
  - Vocabulary tests scores improved by 20% following exercise
- 3) **Cognitive Flexibility improves following exercise**
  - 2007 Study with 40 adults ages 50-64. Half watched a movie, half did a treadmill workout. Each group was tested before, immediately after, and 20 minutes after. The movie group showed no change before and after. The exercising group showed significant improvement in processing speed and cognitive flexibility after a single workout. p54
  - \*cognitive flexibility is creative thinking – eg: asked what are other uses for a newspaper?
- 4) **Complex motor movements cause a surge in BDNF in the cerebellum**
  - Greenough compared running rats (on treadmills) and acrobatic rats (balance apparatus rope ladders, beams, unstable objects in cages). Acrobatic rats had a 35% increase in BDNF in the cerebellum. Running rats had no increase.
- 1) **Aerobic Exercise:**
  - \*elevates neurotransmitters
  - \*creates new blood vessels
  - \*increases flow of brain factors (BDNF and others)
  - \*spawns new stem cells
- 5) **Complex movements:**
  - \*strengthens and expands networks
  - \*improves brain plasticity: crossover effect new circuits are recruited for other areas:
    - learning piano improves math skills SPARK p 56
    - dancers moving to irregular rhythms
  - \*learning complex motor skills challenges the brain (Hebb)
    - Circuits linking cerebellum, basal ganglia, and prefrontal cortex begin to work in better harmony *allowing movements to become more precise*
    - repetition increases the thickness of the myelin sheath: speed and quality of the signals increases SPARK p56