

Exercise: The Ultimate Brain Booster and Stress Reducer

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I. Basic terms: Brain power for everyone

- A. Cognitive function: the process of thought
- B. Mild cognitive impairment (MCI): person has problems with memory, language or other mental function: does not interfere with daily life
- C. Intelligence quotient: IQ, which is a measure of intelligence
- D. Cognitive reserve: mind's resilience to neurological damage
- E. Neuroplasticity: ability of brain to change structure and function (at any age)
- F. Dementia: general term for loss of memory & IQ abilities: interferes with daily life
- G. Cognitive stimulating activities: Anything that engages the brain and helps it do new things such as photography classes, designing a quilt, working with technology, learning a language, performing new dance steps or playing a music instrument

II. Exercise and brain health research in children (4-18 years)

- A. Increase in math tests, academic readiness, intelligence quotient, verbal skills, achievement in academics overall and an increase in perceptual skills (like playing tennis)
- B. "...physical fitness in children is linked in a direct way to important brain structure differences, and such differences are reflected in the children's academic performance..."
- C. Aerobic exercise (BEST), resistance training, physical education, and perceptual motor skills training all improve brain health. (Physiological increase in cerebral blood flow, alterations in brain neurotransmitters, changes in central nervous system; Learning/Developmental is movement and physical activity provide experiences that are necessary for optimal cognitive development)
- D. Perceptual motor skills: examples include hand-eye coordinator, body-eye coordination, postural adjustment and visual-auditory skills)

III. Exercise and brain health for high school students

- A. Doing exercise and/or sports participation
- B. Higher grades, better parental relations, less drug use

IV. How does exercise improve brain function and cognition in youth?

- A. Increase in cognitive reserve (mind's resilience to neurological damage)
- B. Greater cortical development; cerebral cortex is involved in information processing and language
- C. Great news: increased cognitive health as a child (from exercise) extends into adulthood

V. Great review studies: Preventing Cognitive Decline and Dementia: A Way Forward. National Academy of Sciences, 2017, and Barha et al. (2017). Personalizing exercise recommendations for brain health: considerations and future directions. British Journal of Sports Medicine, 51:636–639.

- A. Not much research with young adults
- B. Most research done with 'VP' populations: vintage persons
- C. Leisure time physical activity and structured exercise promote brain health
- D. Physical activity improves cognitive function, brain structure and brain function
- E. Higher intensity levels of exercise are better than low to moderate levels for preventing cognitive decline
- F. Higher intensity exercise also leads to greater brain plasticity
- G. For adult men and women, exercise imparts a neuroprotective effect on the brain
- H. Exercise boosts brain health and cognitive functioning
- I. What about BDNF? Brain-derived neurotrophic factor is a protein involved in nerve growth and maintenance in the brain: aerobic exercise has been show to increase BDNF levels
- J. Executive central command improvements include the following from exercise

- a. Increase in working memory, planning ability, scheduling ability
- b. Increase in multitasking ability and increase in dealing with doubt

K. Engaging in higher levels of physical activity is associated with reduced risk of dementia

L. Enhanced functional brain plasticity and neurogenesis from exercise

VI. What type of exercise program is best to improve cognitive function? 2017 National Academy of Sciences: Physical activity has consistently been identified as one of the modifiable risk factors that could have the greatest impact on rates of cognitive impairment and dementia

A. Aerobics and resistance training: these training programs encourage a broad range of neural and chemical adaptations in the brain

D. Mechanisms for exercise for brain health

1. New cell generation in hippocampus; area for learning and memory
2. Increase in neurotransmitters; chemical messengers
3. Increase in brain vessels: better oxygen circulation in brain
4. Research clearly shows that interventions that are good for cardiovascular health, such as aerobic conditioning, are good for brain health. 'A sound mind in a sound body.'

E. Special note: A majority of dementia patients show signs of cerebrovascular disease; it is plausible that blood pressure management will also reduce the risk of dementia and cognitive decline.

Review of the new blood pressure categories (normal is Systolic less than 120 and diastolic less than 80)

F. Resistance training and the brain research review: improved memory, improved self-esteem, improved cognition, improved quality of sleep, much less chronic fatigue, may lessen depression, improved executive control

VII. 10 fascinating facts of the human brain

A. The brain, which weighs 3 lbs has 100 billion neurons.

B. The brain has ~100,000 blood vessels.

C. You continue to make NEW neurons throughout life, as long as you challenge your brain mentally.

D. The brain uses 20% of the body's total oxygen supply.

E. Too much stress alters brain cells, brain structure and function.

F. You can't tickle yourself because the brain can distinguish between an unexpected touch and your own touch

G. While awake, your brain generates between 10 to 23 watts of power: enough to power a light bulb.

H. Every time you blink, the brain 'kicks in' to keep things illuminated so the world doesn't go dark (during the blink). You blink 20,000 times a day.

I. The average number of thoughts you experience each day is about 70,000.

J. There are no pain receptors in the brain, so it can't feel pain.

Stress management is good brain health: Stress is what you experience when you're having trouble effectively managing some of life's situations

VIII. Piling on the stress

A. Major stressors: divorce, serious illness, and financial crisis

B. Moderate stressors: lose your wallet/purse, denting the car, catching a cold

C. Micro-stressors: noisy traffic, crowds, long lines at a store, cell phones going off in a theatre, deliveries that are late

IX. Physical signs of stress

A. Tired/fatigue, rapid pulse, headache, shakiness, muscle aches, over eating

B. Lack of appetite, body tension, sleep difficulties, lowered libido, unusual fidgeting

C. Rashes, hives, itching

X. Psychological signs of stress

- A. Irritability, worry and anxiety, impatience, panic, moodiness, sadness, feeling upset
- B. Loss of sense of humor, memory lapses, lowered productivity, and feeling overwhelmed
- C. Review of the stress mechanism in brain and body

XI. Handling stress and improving brain health

- A. People have a biological need to ‘disengage’
- B. May need frequent breaks during the day which are ‘get away recharging’ moments
- C. How do civilized society people tend to cope? TV, skipping exercise, eating fats/sugars
- D. Reduce stress tips: cell phone use, work space, vacation, friendships, regular exercise, acts of kindness, vary your daily routine, lifelong learner, be creative, do Pranayama breathing

E. Pranayama breathing and yoga connection? “The practice of asanas develops the muscular strength and flexibility to maintain good posture alignment, which improves diaphragmatic breathing.”

(Slovic study)

F. How do you do Pranayama breathing? Activate the diaphragm. Let’s try it.

XII. Let’s simulate the brain with some brain teasers. What do you see? Plus some think different be different practical applications from the field.

XIII. The science of happiness: Eight steps to a satisfying life!

- A. Count your blessings: “gratitude journal”
- B. Practice acts of kindness: random and systematic
- C. Savor life’s joys: take mental photographs
- D. Thank a mentor: Now
- E. Learn to forgive: let go of anger and resentment (without, you won’t move forward)
- F. Invest time and energy in friends and family
- G. Take care of your body
- H. Develop strategies for coping with stress and hardships

Key References:

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