The Neurology of Longevity: Healthy Lives from a Healthy Mind

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Healthy Life, Long Life

• What expectations do we have with each passing year?
  • Personal, financial, professional, spiritual, educational, emotional

• How do we plan for tomorrow?
• Do we want longevity?
• Do we want health?
Factors affecting life expectancy

- Personal
- Mental exercise
- Work status
- Nutrition: Meat (amount and type) Plant-based diet Calcium intake
- Education
- Sleep / coping stress
- Relationships / spirituality
Factors affecting life expectancy

- Lifestyle
- Dental care
- Sunscreen
- Alcohol
- Tobacco
- Air quality
- Risk aversion

- Medical & genetics
- Bowel frequency
Life Expectancy Calculator

- Personal
- Lifestyle
- Nutrition
- Medical
- Family
- (I’m supposed to live to 91!!!)

- livingto100.com
How do you plan on living at 100?

• With a whimper?

• With a BANG !!!
Balance of Longevity

Physical
Nutritional
Social
Mental
What’s missing in our life?

Physical

Nutritional

Mental

Social
Physical activity & the brain

- Do enriched environments build better brains?
- Does exercise build a better brain? Do you need both?
- Mice and running wheels
- Cognitive testing and brain structure
- Brain-derived Neurotropic Factor (BDNF)

How exercise could lead to a better brain, NYT 4/18/2012
BDNF

MiracleGrow for the brain

Plays a role in memory formation and in the role between stress and depression
Experimental Model

- frequent use causes synapses to swell and make stronger connections by sprouting new branches
BDNF
HIPPOCAMPUS

Exercising vs sedentary mice

Water maze learning
Exercise in adulthood

- More BDNF with exercise

- How much
  - 30-60 minutes/day
  - 18 minutes or less

- What type (walkers had larger hippocampi than stretchers after a year)
  - Aerobic
  - Strength
  - Flexibility & stretching
• “Fake” exercise increased the AMPK (AMP-activated protein kinase) enzyme or cholesterol drug that stimulated biochemical changes mimicking endurance running

• After a week, mice performed better on memory and learning tasks

• NEUROGENESIS & MEMORY

• After another week, medicated mice stopped responding, losing ability to learn

Exercised mice kept on making improvements

How working the muscles may boost brainpower, NYT May 9, 2012
Learn Mem, 2011 Feb; 19(2) 103-107
Exercise in childhood

• Improves learning
• Reduces stress
• Improves mental conditions
• ADHD
Exercise affects kids intelligence

• Fittest kids have fitter brains and better cognitive scores

• Exercise increases size of basal ganglia & hippocampus
What’s my number?

- Body Mass Index calculation
  - HOW IS IT CALCULATED
  - Underweight <18.5
  - Normal 18.5-24.9
  - Overweight 25-29.9
  - Obese >30
Calculating BMI

- LIMITATIONS
  - Overestimating body fat in athletes and others who have a muscular build
  - Underestimates body fat in older persons and others who have lost muscle

- Waist circumference
  - If most of your fat is around our waist rather than at your hips, there is a higher risk of type 2 DM and heart disease
    - Women 35” waist
    - Men 40” waist

www.nhlbislidesupport.com/bmi
Getting bigger fast: over 20 percent of American adults are obese. Many are now 15 percent overweight. This is a clear health warning sign.

The BMI (Body Mass Index) is a useful tool for assessing weight. Higher BMIs indicate a higher risk of health problems such as heart disease, diabetes, and other chronic conditions.
Aerobic Fitness

- www.aerobictest.com
Exercise as a form of medicine

• Parkinson’s patients who train 40 minutes on a stationary tandem bicycle see a 35% improvement in motor function and increase brain activation

• THIS IS SIMILAR TO LEVODOPA!!

• Benefits in depression, diabetes, ADHD, dementia, and osteoporosis

www.exerciseismedicine.com
Balance of Longevity

- Physical
- Nutritional
- Social
- Mental
Nutrition & the brain
Nutritional status and brain function in aging

- Biochemical indices of nutrition status assessed in 28 healthy people >60 y.o. were related to EEG indices and neuropsych function
- Decrement in alpha waves with low thiamin
- Study found significant correlations between indices of nutrition status and neuropsych function, indicated by EEG and neuropsych testing

ORAC scores

• Protective antioxidants found in the vitamins and minerals of plant foods, fruits, nuts, seeds, grains

• Oxygen Radical Absorbance Capacity

• High in blueberries, blackberries, raspberries, strawberries, avocado, red grapes, navel oranges
Nutrition and brain function

The amazing blueberry

- As we age, loss of mental agility may be due to poor **communication** as much as cell loss (Dopamine stimulation)
- **Protective** effect of antioxidant-rich food leading to less age-related cognitive performance decline
- **Reversal** of function loss
- **Reduction** of inflammation which can contribute to neuronal and behavioral aging problems
- Blueberry compounds cross the BBB and localize in rodent brain tissue
Alzheimer’s Rats

• Rat model showed plaque buildup of amyloid beta with cell death and poor neuronal communication

• Brain-plaqued rats fed blueberry extract performed as well as healthy control mice, better than their peers

• SAME AMOUNT OF PLAQUES

• Increased activity of protein kinase enzymes ERK & PKC enhanced signaling in certain receptors - COMMUNICATION
Neuronal Plasticity

• Old rats fed BB showed increased NEUROGENESIS in the hippocampus, enhanced proliferation of neuronal precursor cells and better performance of spatial memory tests
Inflammation and Microglia

- BB extract shown to have a preventive effect on inflammatory signals coming from activated microglia cells
- BB reduced expression of inflammatory enzymes normally stimulated during oxidative stress
Superfoods for the Brain

- Blueberries
- **Wild salmon** rich in omega-3 essential fatty acids. Antiinflammatory
- Nuts and seeds. Vitamin E sources
- Avocados. Fatty but monounsaturated fat, good for blood flow, good for the brain
- **Whole grains** reduces risk of heart disease improving cerebrovascular function
Healthiest diets on earth

Sardinia
Okinawa
Nova Scotia
Various features of the Sardinian diet can add an average of six years to your life expectancy.
Blue Zones
Lessons for Living Longer from the People who’ve Lived the Longest
Diet: Caloric Restriction

- Caloric restriction (CR), or calorie restriction, is a dietary regimen that restricts calorie intake, where the baseline for the restriction varies, usually being the previous, unrestricted, intake of the subjects. Calorie restriction without malnutrition has been shown to improve age-related health and to slow the aging process in a wide range of animals and some fungi.

- CR is one of the few dietary interventions shown to increase both median and maximum lifespan in a variety of species, among them yeast, fish, rodents and dogs. There are ongoing studies on whether CR works in primates, on its effects on human health, and on the metabolic parameters associated with CR in other species. The results so far are positive, but the studies are not yet complete, due to the long lifespan of the species. Among the current studies, one at UCSF is looking at long-term CR practitioners, including the psychological factors that keep them motivated to stay on a CR diet.
US obesity epidemic

- 68% of adults are either obese or overweight
- 32% of children are either overweight or obese

www.healthyamericans.org
Obesity (BMI > 30) in 2010
Public involvement, media attention

- www.michaelpollan.com
Media is waking up
Media is waking up!
Nutrition

- Type 1 diabetes is convincingly linked to infant feeding practices
- Heart disease can be reversed with diet alone
- Dairy foods can increase the risk of prostate cancer
- Antioxidants in fruits and vegetables are linked to better performance in old age
- Kidney stones can be prevented by a healthy diet
What to do: Diet

- Increase polyphenols
- Eat more dark skinned fruits and vegetables (green tea, red wine, dark chocolate)
- Increase omega-3
- Increase fiber
- Reduce calories
- Exercise to decrease inflammation
Nutritional Factors

- Sirtuin gene activation
  - reduces inflammation
  - modulates production of vasodilators
  - helps prevent cancer
  - protects against ravages of stress
  - activated by polyphenols found in red wine
  - role in Alzheimer’s, diabetes, aging
Nutritional Factors

Resveratrol
Balance of Longevity

- Physical
- Nutritional
- Social
- Mental
Social
Positive social interactions

- Friends
- Family
- Work
- Play

**Osho - Laughter is the very essence of religion**

Osho - Laughter is the very essence of religion. Seriousness is never religious, cannot be religious. Seriousness is of the ego, part of the very disease. Laughter is egolessness.
Contagious Happiness & Social Contagion

• Christakis & Fowler linked 5,124 subjects in a web or 53,228 ties

• Weight changes broke out in clusters

• People are connected so there health is connected NEJM July 2007

• Not only obesity, but also happiness. Behaviors like smoking, alcohol

Are your friends making you fat? NYT Sept 13, 2009
Contagious Happiness

A new study finds that a person’s happiness is influenced by the happiness of close friends and family, and to a lesser extent by the friends of friends, up to three degrees of separation.

Happiness in clusters

The diagram above shows the relationships among 1,020 people in 2000. Groups of happy and unhappy people are visible as light and dark clusters.
Contagious Happiness and Fitness

• When a person became obese, his or her friends were 57% more likely to become obese.

• If social reinforcement can make us fat, it make us thin.

Christakis NA, Fowler JA: Spread of obesity in a large social network, NEJM 357: 370-9, 2007
Interpersonal Neurobiology

- Dopamine
- Serotonin
- Oxytocin
- Vasopressin

Ackerman D: The Brain on Love, NYT, March 24, 2012
Your brain in love, Scientific American Magazine, Feb 2011
Balance of Longevity

- Physical
- Nutritional
- Social
- Mental
Mental Exercises
Grow Brain Cells

- Music
- Games
- Education
- Study
Mental Mentors
Engage the mind

- Life’s work
- Learn something new
- Family engagement
- Friends and more friends
- Your pets will help you live longer
It’s a basic biological drive integral to our health and hardwired into our brains.
Training the brain

- can you make yourself smarter?
- live longer?
Thank You!