Six Steps To Boost Your Memory and Grow Your Brain

Majid Fotuhi, MD PhD
Medical Director: NeuroGrow Brain Fitness Center
Chief Medical Officer: Neurocore Brain Performance Center
Affiliate Staff: Johns Hopkins Medicine

Neuroplasticity in the Human Brain: My Research & Publications

Modifiable factors that alter the size of the hippocampus with ageing

Majid Fotuhi, David Do and Clifford Jack

Abstract | The hippocampus is particularly vulnerable to the neurotoxic effects of obesity, diabetes mellitus, hypertension, hypoxic brain injury, obstructive sleep apnoea, bipolar disorder, clinical depression and head trauma. Patients with these conditions often have smaller hippocampi and experience a greater degree of cognitive decline than individuals without these comorbidities. Moreover, hippocampal atrophy is an established indicator for conversion from the normal ageing process to developing mild cognitive impairment and dementia. As such, an important aim is to ascertain which modifiable factors can have a positive effect on the size of the hippocampus throughout life. Observational studies and preliminary clinical trials have raised the possibility that physical exercise, cognitive stimulation and treatment of general medical conditions can reverse age-related atrophy in the hippocampus, or even expand its size. An emerging concept—the dynamic polygon hypothesis—suggests that treatment of modifiable risk factors can increase the volume or prevent atrophy of the hippocampus. According to this hypothesis, a multidisciplinary approach, which involves strategies to both reduce neurotoxicity and increase neurogenesis, is likely to be successful in delaying the onset of cognitive impairment with ageing. Further research on the constellation of interventions that could be most effective is needed before recommendations can be made for implementing preventive and therapeutic strategies.

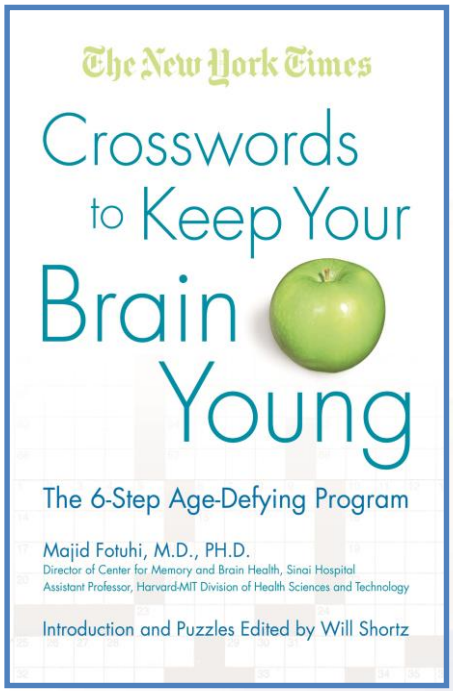
Fotuhi, M. *et al. Nat. Rev. Neurol.* **8**, 189–202 (2012); published online 13 March 2012; doi:10.1038/nrneurol.2012.27

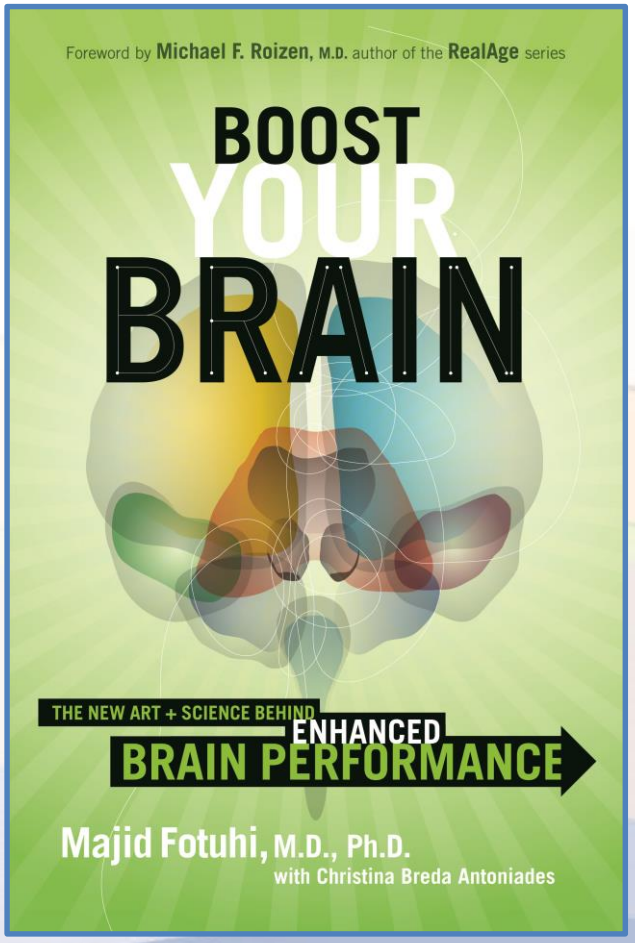
Changing perspectives regarding late-life dementia

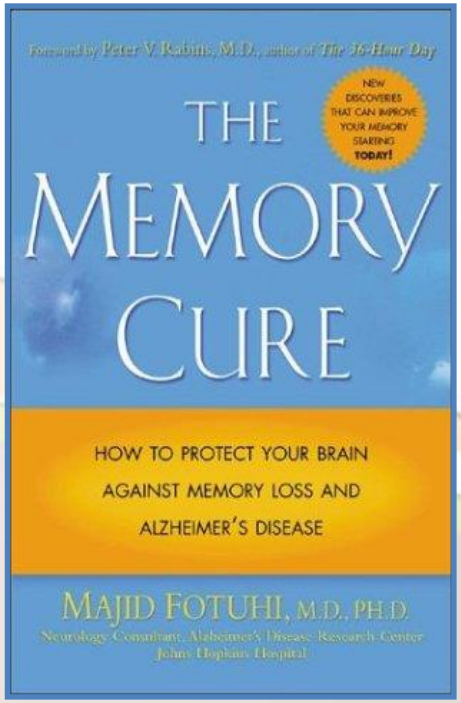
Majid Fotuhi, Vladimir Hachinski and Peter J. Whitehouse

Abstract | Individuals over 80 years of age represent the most rapidly growing segment of the population, and late-life dementia has become a major public health concern worldwide. Development of effective preventive and treatment strategies for late-life dementia relies on a deep understanding of all the processes involved. In the centuries since the Greek philosopher Pythagoras described the inevitable loss of higher cognitive functions with advanced age, various theories regarding the potential culprits have dominated the field, ranging from demonic possession, through 'hardening of blood vessels', to Alzheimer disease (AD). Recent studies suggest that atrophy in the cortex and hippocampus—now considered to be the best determinant of cognitive decline with aging—results from a combination of AD pathology, inflammation, Lewy bodies, and vascular lesions. A specific constellation of genetic and environmental factors (including apolipoprotein E genotype, obesity, diabetes, hypertension, head trauma, systemic illnesses, and obstructive sleep apnea) contributes to late-life brain atrophy and dementia in each individual. Only a small percentage of people beyond the age of 80 years have 'pure AD' or 'pure vascular dementia'. These concepts, formulated as the dynamic polygon hypothesis, have major implications for clinical trials, as any given drug might not be ideal for all elderly people with dementia.

Fotuhi, M. *et al. Nat. Rev. Neurol.* **5**, 649–658 (2009); published online 17 November 2009; doi:10.1038/nrneurol.2009.175


The New York Times
Crosswords to Keep Your Brain Young
The 6-Step Age-Defying Program
Majid Fotuhi, M.D., PH.D.
Director of Center for Memory and Brain Health, Sinai Hospital
Assistant Professor, Harvard-MIT Division of Health Sciences and Technology
Introduction and Puzzles Edited by Will Shortz


Foreword by Michael F. Roizen, M.D. author of the RealAge series
BOOST YOUR BRAIN
THE NEW ART + SCIENCE BEHIND ENHANCED BRAIN PERFORMANCE
Majid Fotuhi, M.D., Ph.D.
with Christina Breda Antoniades


Foreword by Peter V. Rabins, M.D., author of The 36-Hour Day
NEW DISCOVERIES THAT CAN IMPROVE YOUR MEMORY STARTING TODAY!
THE MEMORY CURE
HOW TO PROTECT YOUR BRAIN AGAINST MEMORY LOSS AND ALZHEIMER'S DISEASE
MAJID FOTUHI, M.D., PH.D.
Neurology Consultant, Alzheimer's Disease Research Center
Johns Hopkins Hospital


NBC


USA
WEEKEND
MAGAZINE


Forbes


npr


NATIONAL
GEOGRAPHIC™


CNN


FOX
NEWS

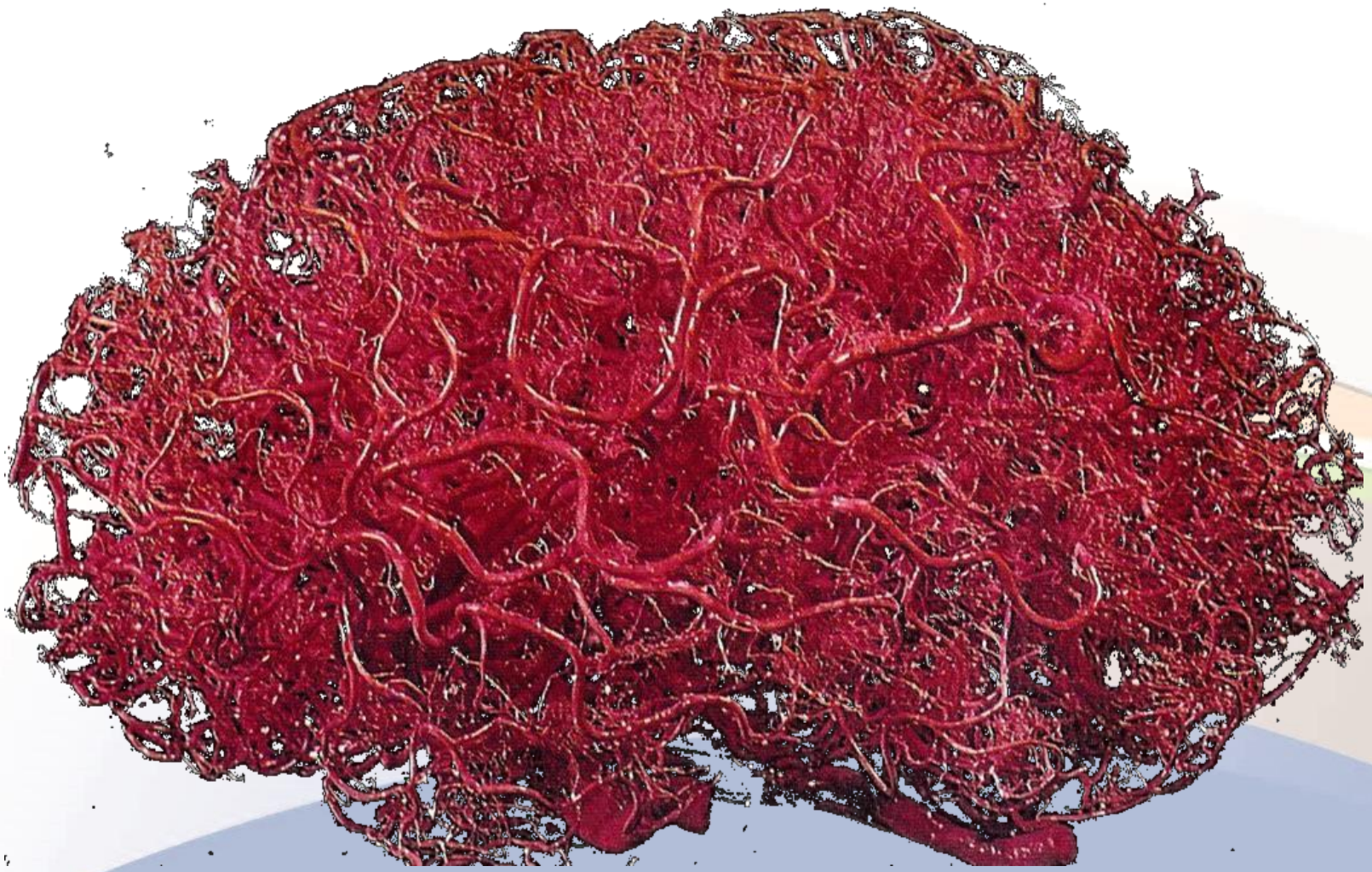

CBS


AARP

Objectives

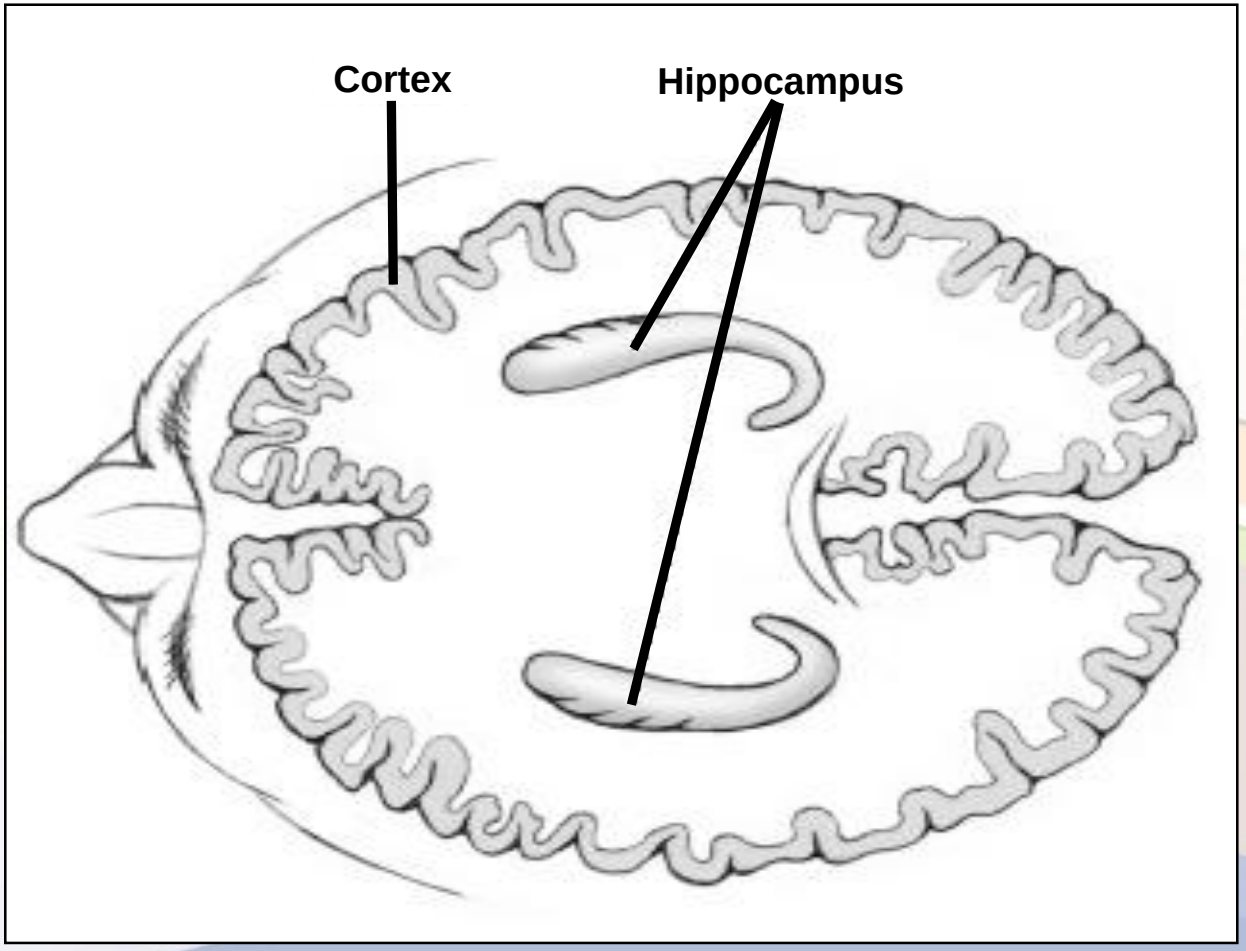
1. Basic Anatomy of Memory, Attention, and Decision Making
2. Effects of Aging on Your Brain
3. Six Ways to Sharpen Your Brain
4. Brain Fitness Program

Brain has lots of blood vessels



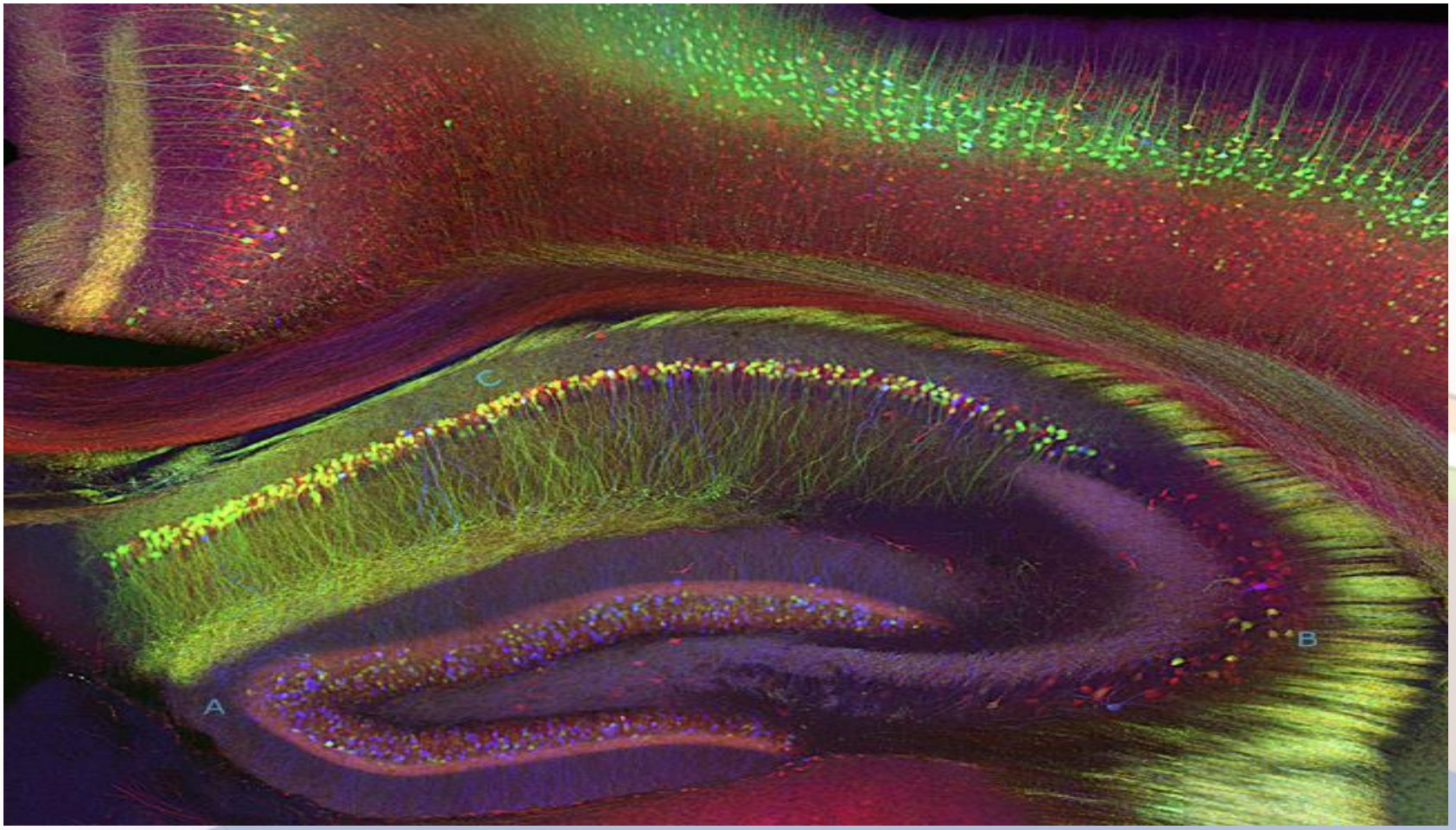
Zlokovic et al. Neurosurgery 43(4), 877–78, 1998

Hippocampus: Short-term memory
Cortex: Long-term memory



Hippocampus

Neurons in Hippocampus



Objectives

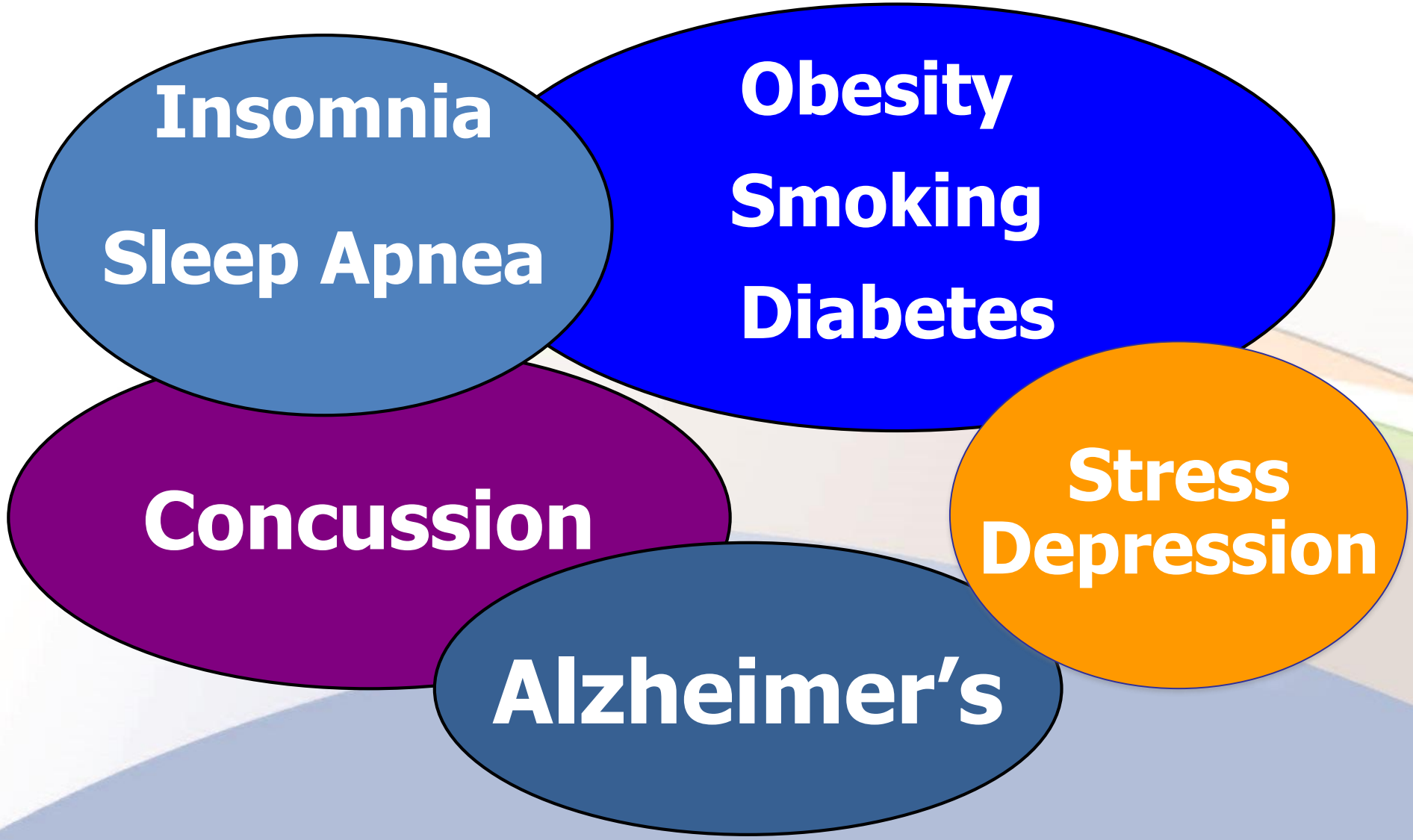
1. Basic Anatomy of Memory, Attention, and Decision Making
2. Effects of Aging on Your Brain
3. Six Ways to Sharpen Your Brain
4. Brain Fitness Program

With aging, hippocampus and cortex shrink faster than the rest of the brain

- They atrophy by about 0.5% per year after age 50
- With advancing age, we have more difficulty with
  - Memory
  - Sustained attention
  - Processing information quickly

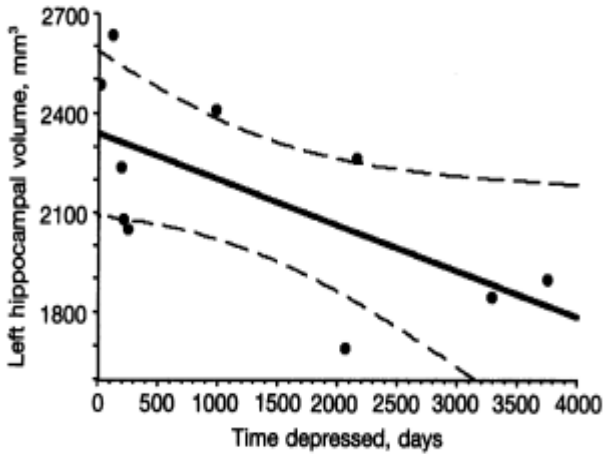
Fjell et al, J. Neuroscience 2009

What Causes Atrophy in the Cortex & Hippocampus?

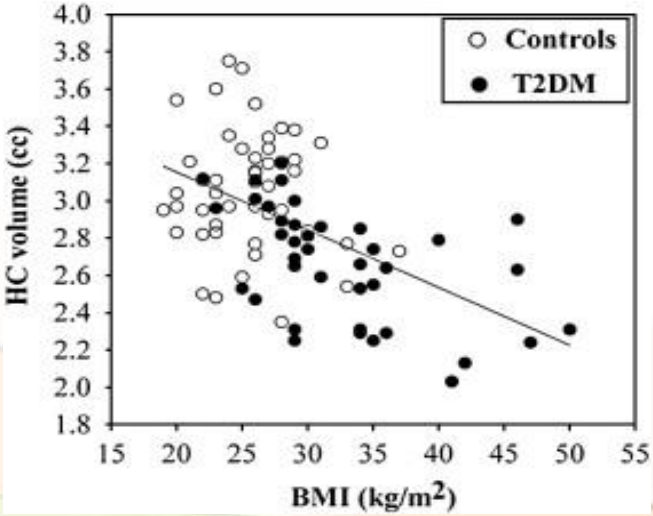


More Depression, Obesity, Stress, and Insomnia, Smaller Hippocampus

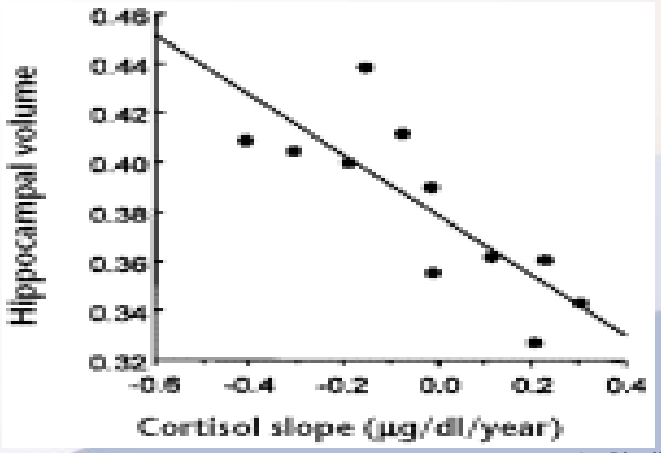
Depression[1]



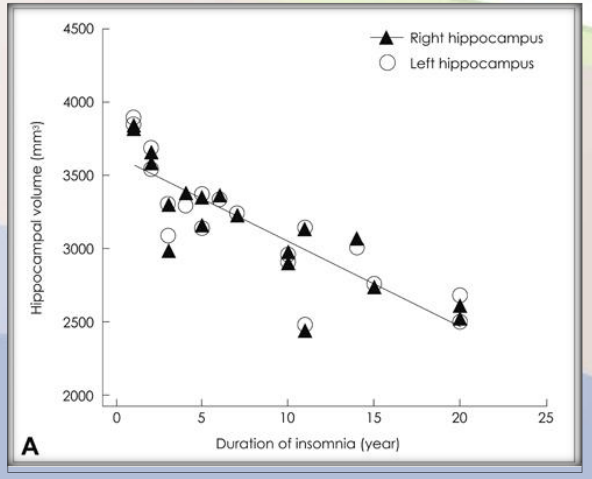
Obesity[2]



Cortisol / Stress[3]

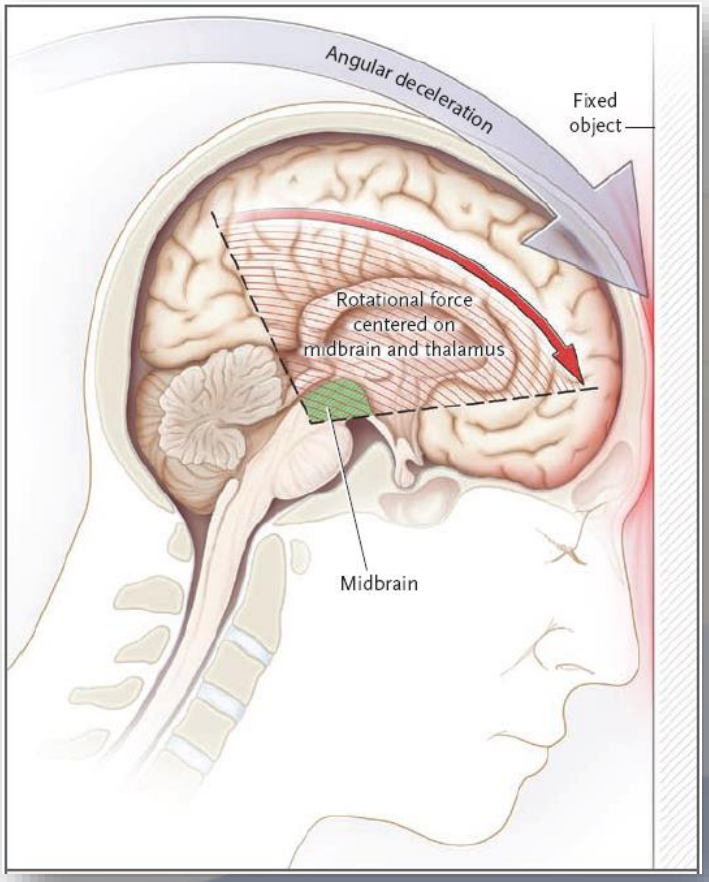


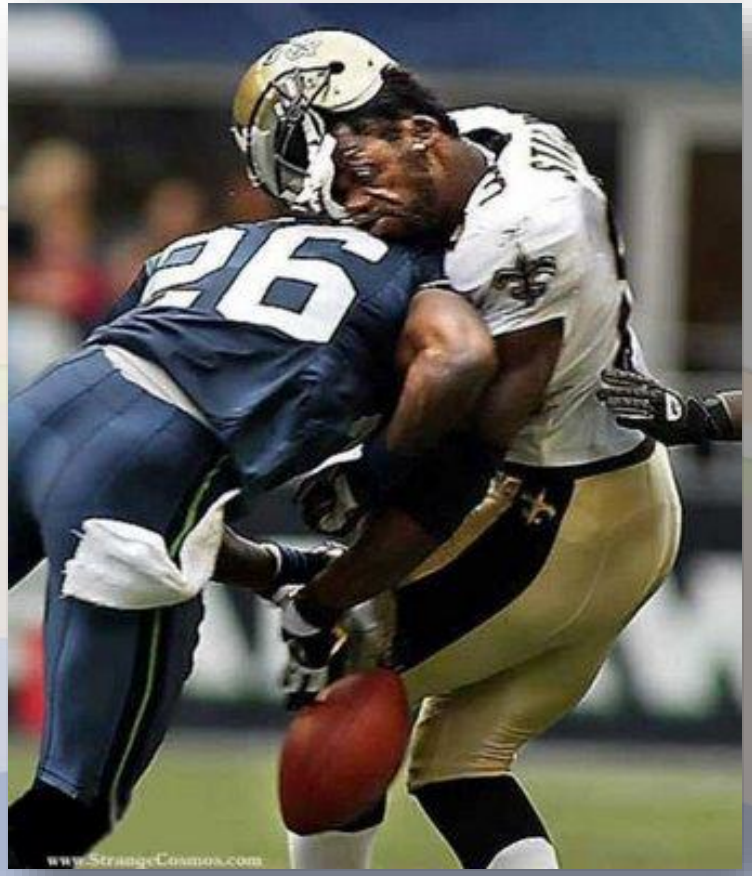
Insomnia[4]



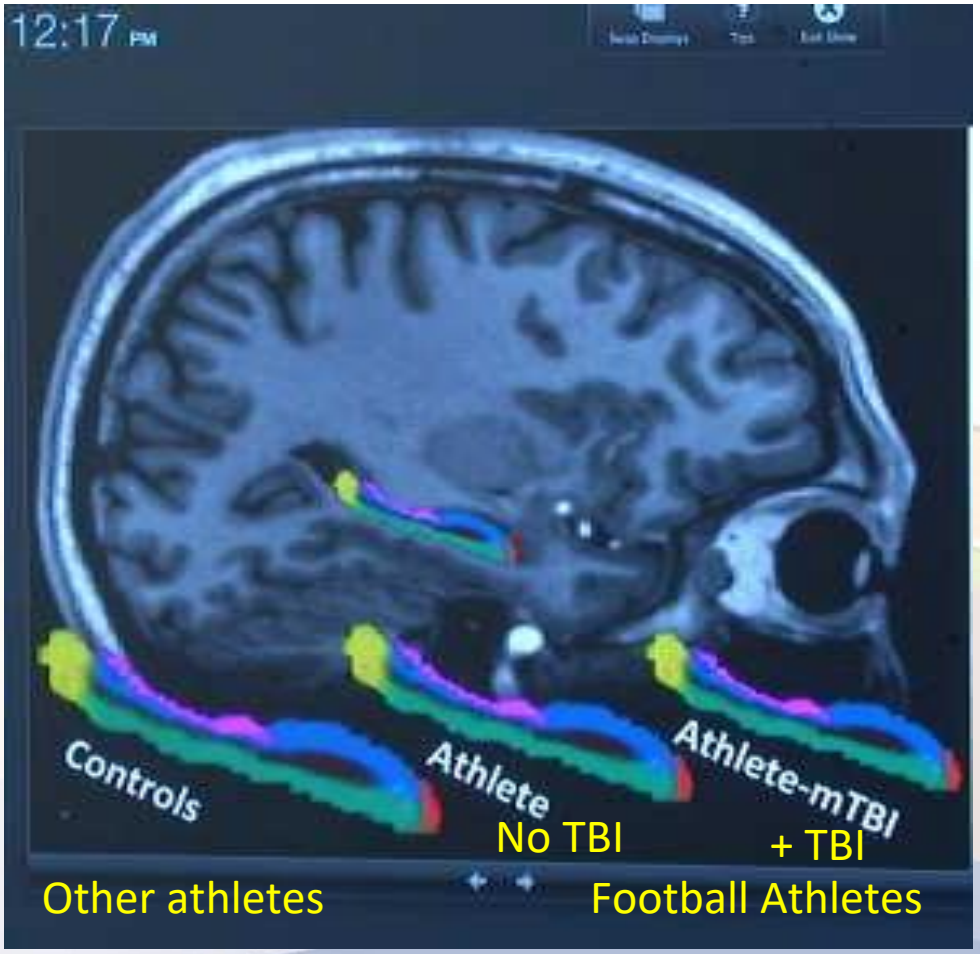
1- Sheline, (1996). *PNAS*, 93(9);3908-13.
2- Brain Research, 2009, Pages 186–194
3- Lupien et al (1998), Nature NeuroSci 1 (1), 69-73
4- Ho et al; J Clin Neurol. 2012 Jun;8(2):130-8

More Traumatic Brain Injury (TBI), Smaller Cortex & Hippocampus



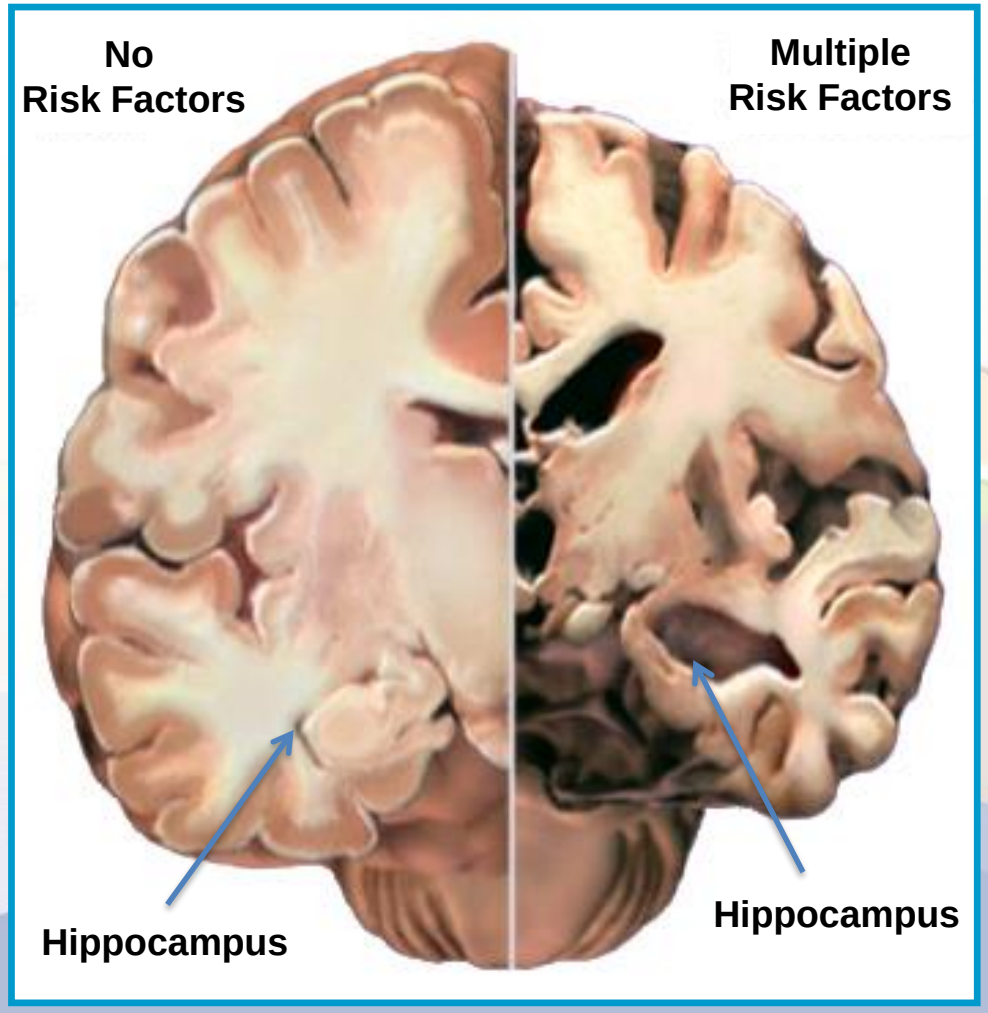


More Football, Smaller Hippocampus



Singh, JAMA neurology, 2014

Multiple Risk Factors, Much Smaller Cortex & Hippocampus



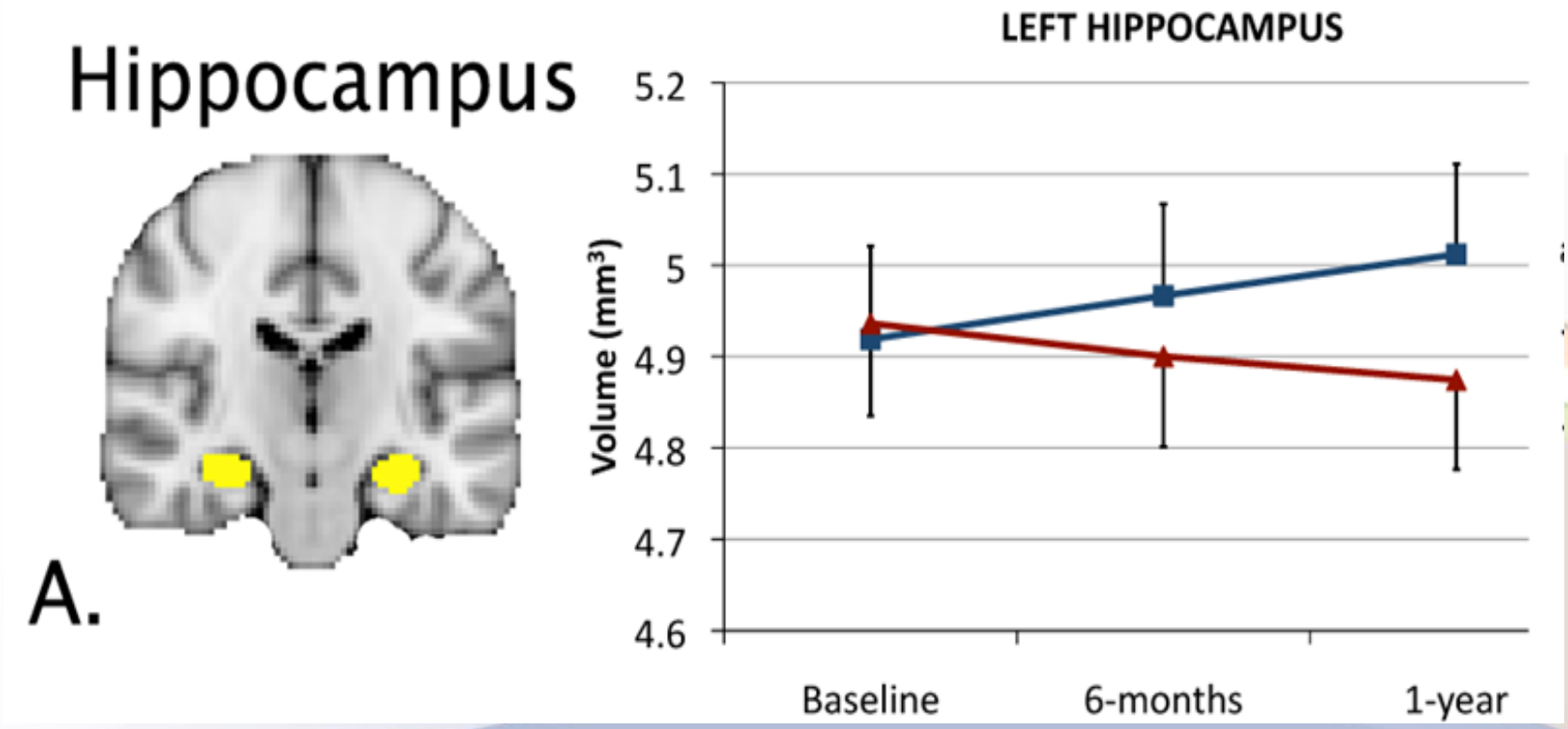
Brain-healthy Diet
Physical Fitness
Cognitive Stimulation
Quality sleep
Peace of Mind

Diabetes
Hypertension
Obesity
Sleep Apnea
Insomnia
Head Trauma
Genes
Stress

Objectives

1. Basic Anatomy of Memory, Attention, and Decision Making
2. Effects of Aging on Your Brain
3. Six Ways to Sharpen Your Brain
4. Brain Fitness Program

1. More Exercise, Bigger Hippocampus

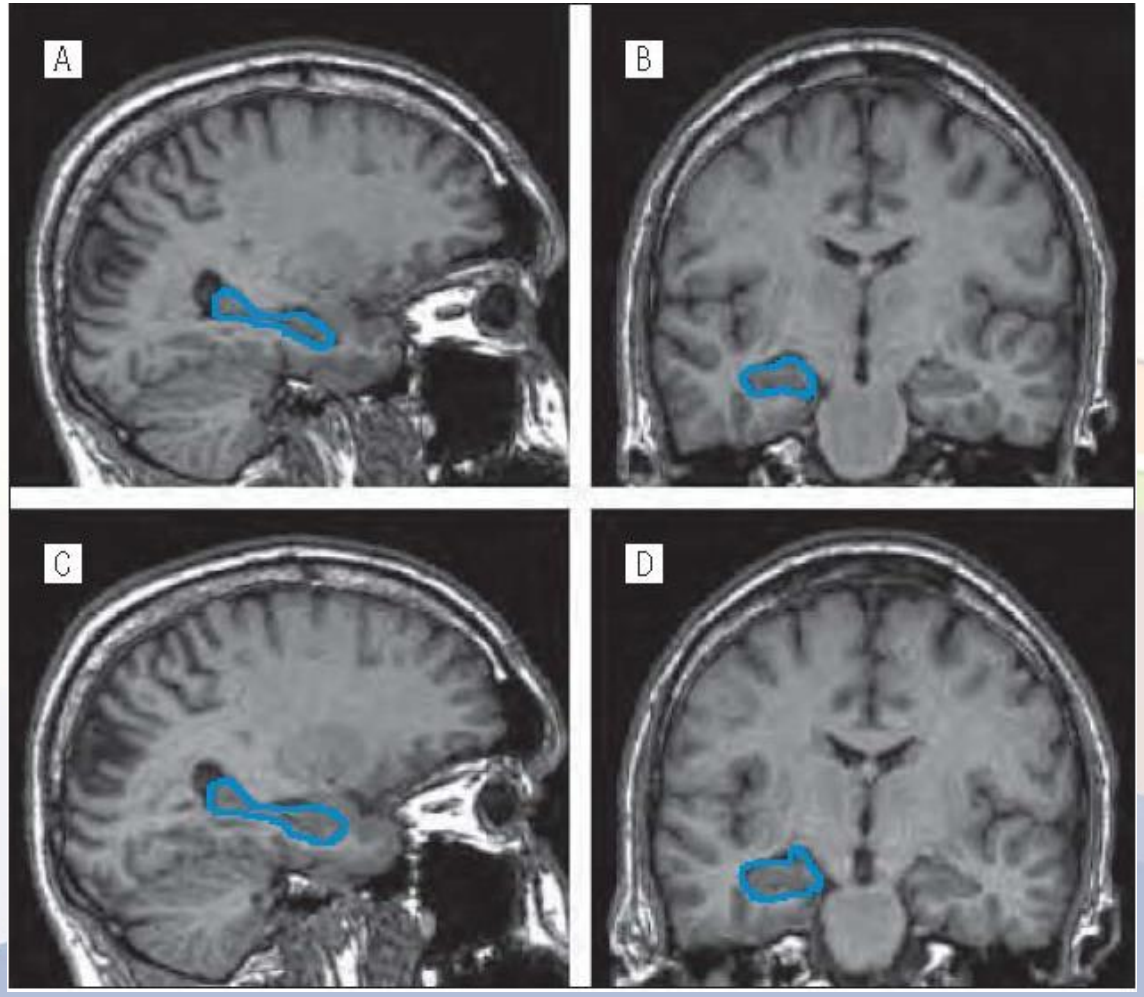


Erikson, PNAS 2011

More Exercise, Bigger Hippocampus, Even After 3 Months

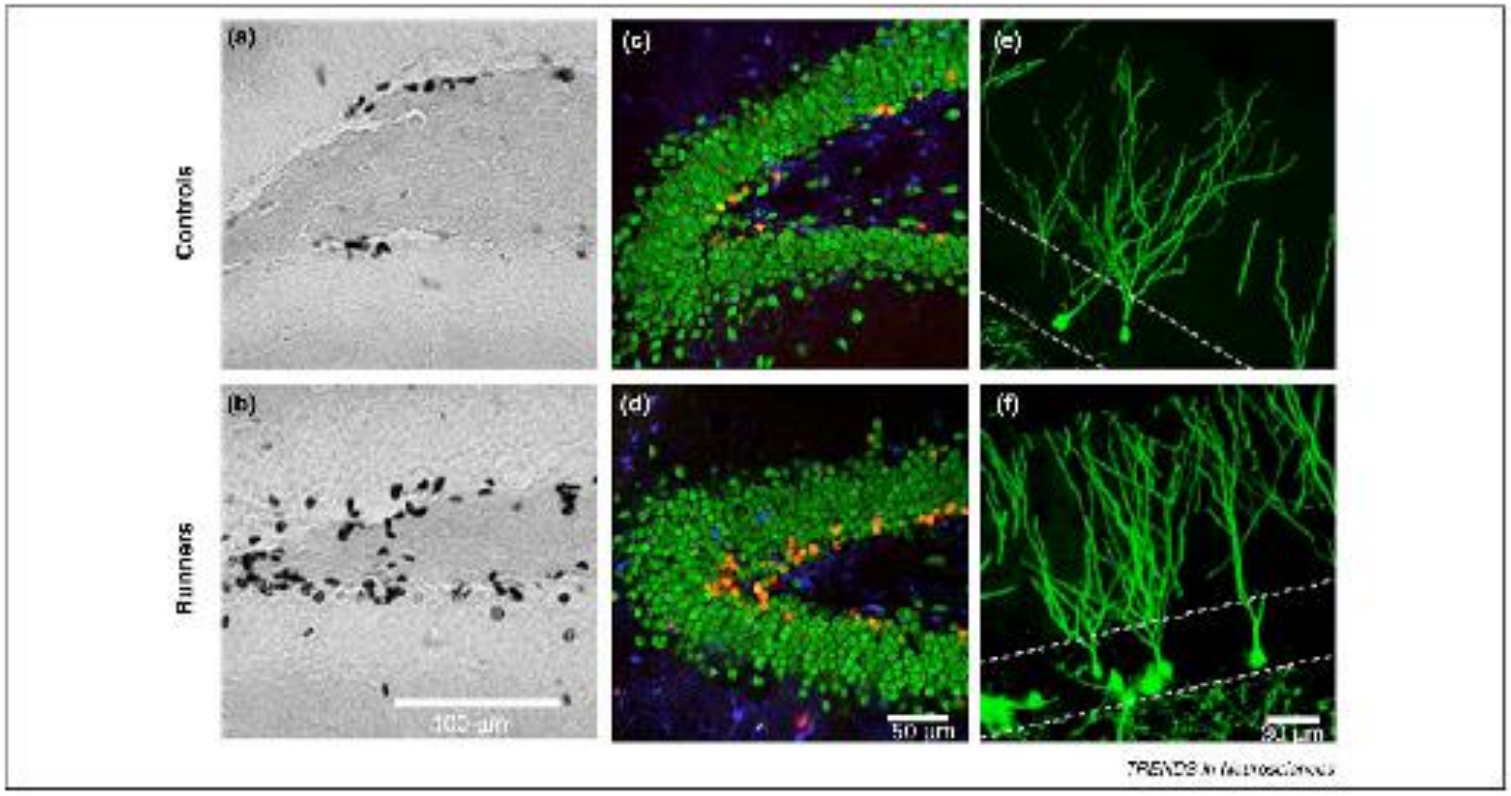
Before

After



Arch Gen Psychiatry, 2010

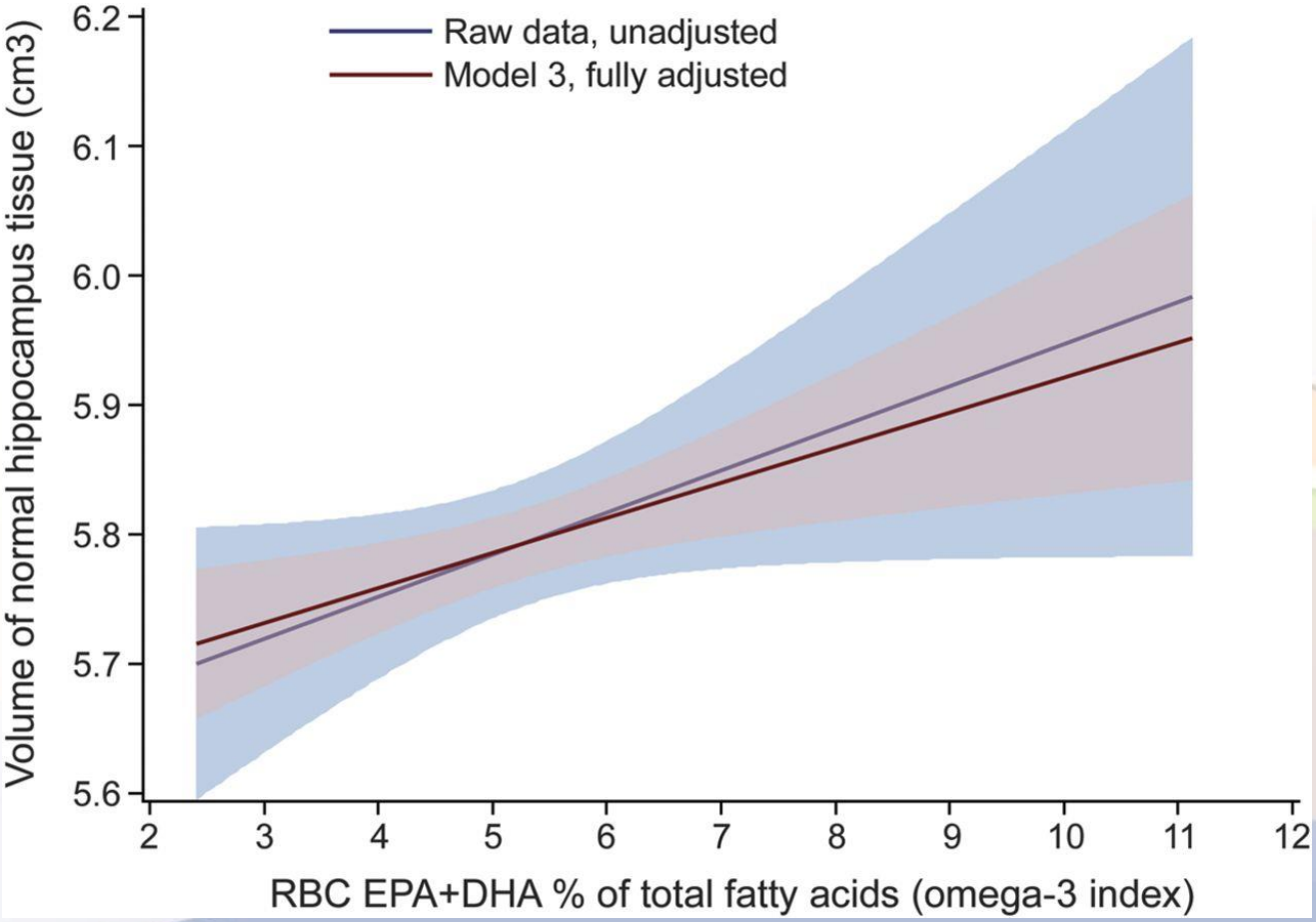
More Exercise: More Neurogenesis



Van Praag, Trends in Neurosciences, 2009

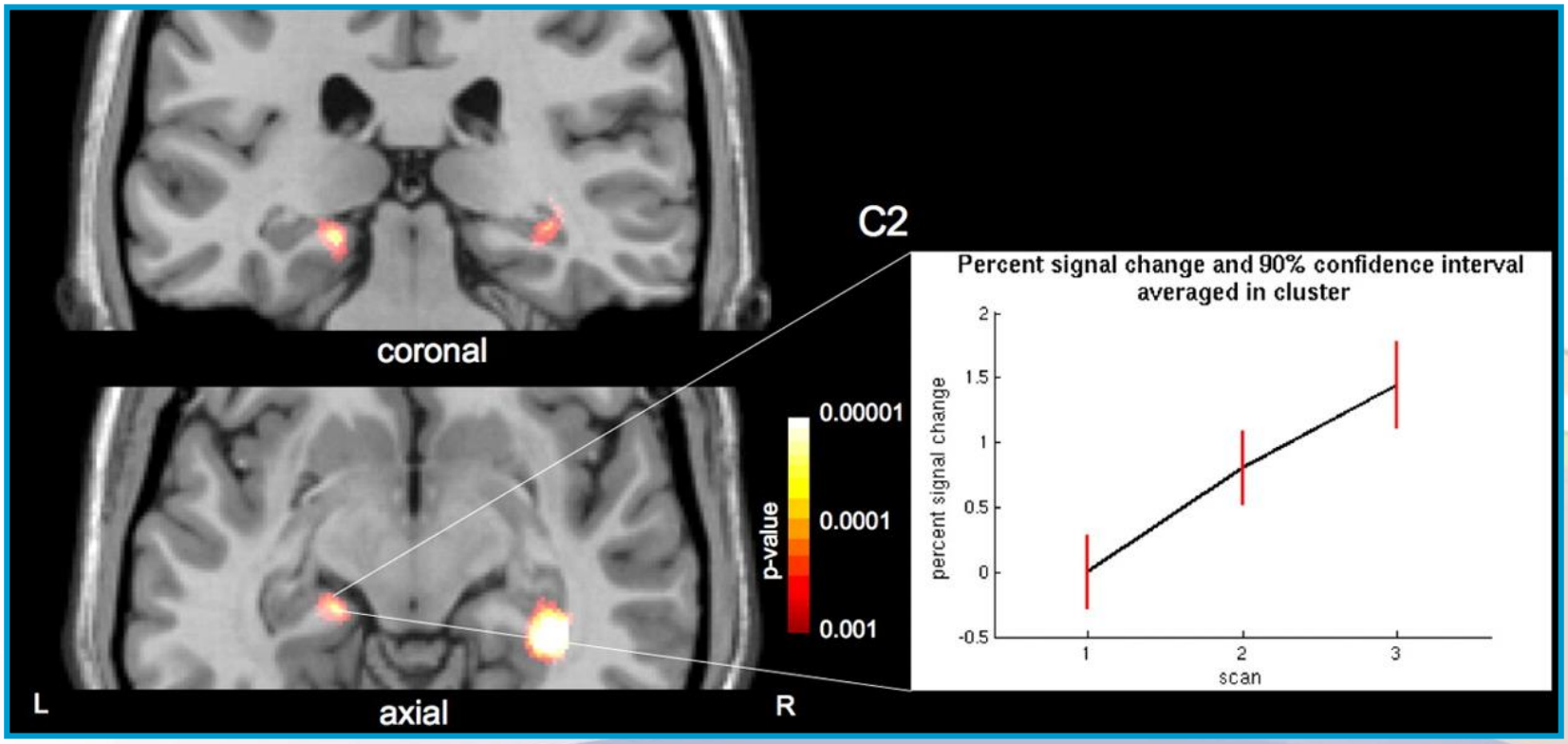
2. More Omega-3 Fatty Acids, Bigger Hippocampus

More Omega-3 Fatty Acids, Bigger Hippocampus



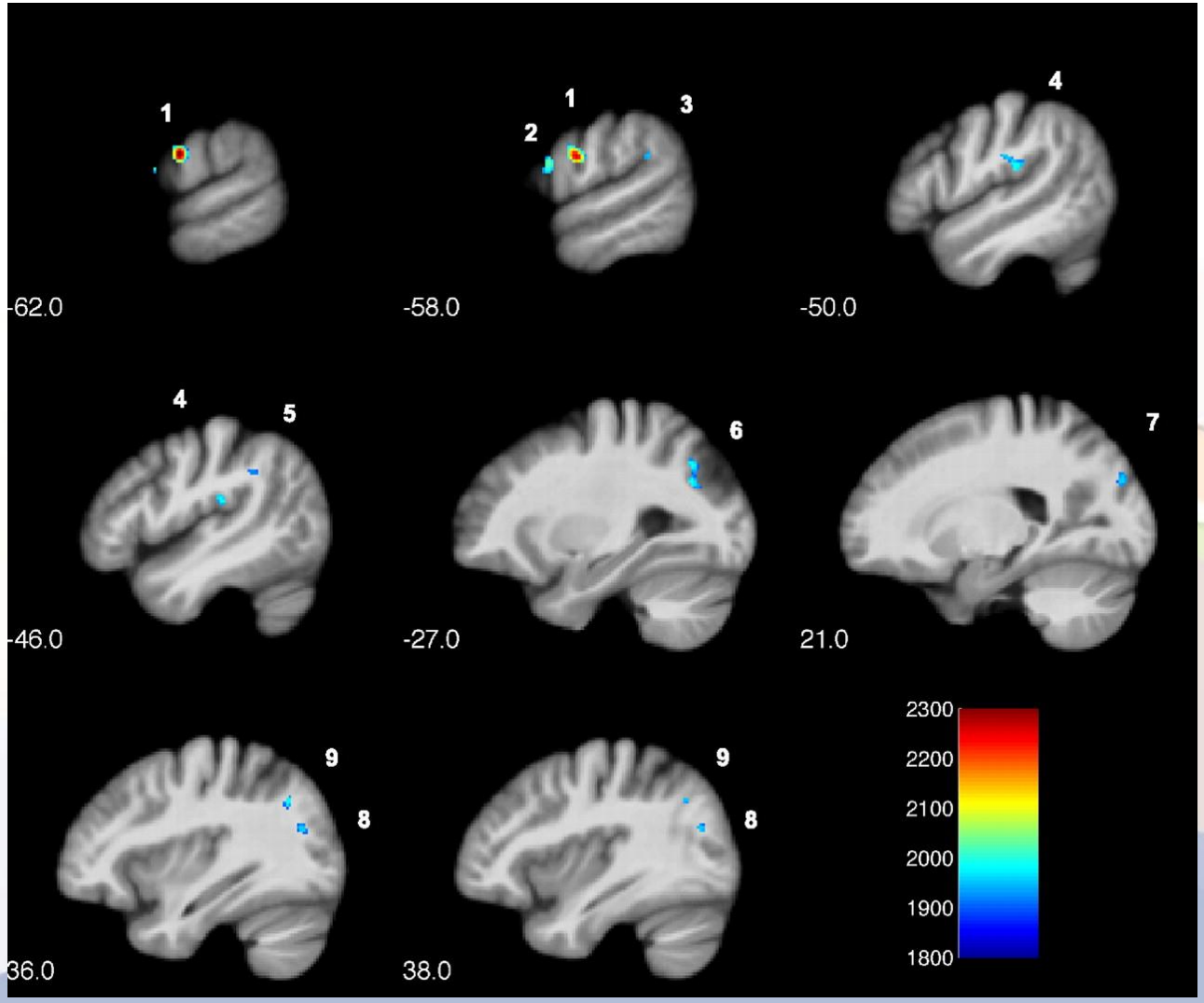
Pottala J V et al. Neurology 2014;82:435-442

3. More Learning, Bigger Hippocampus



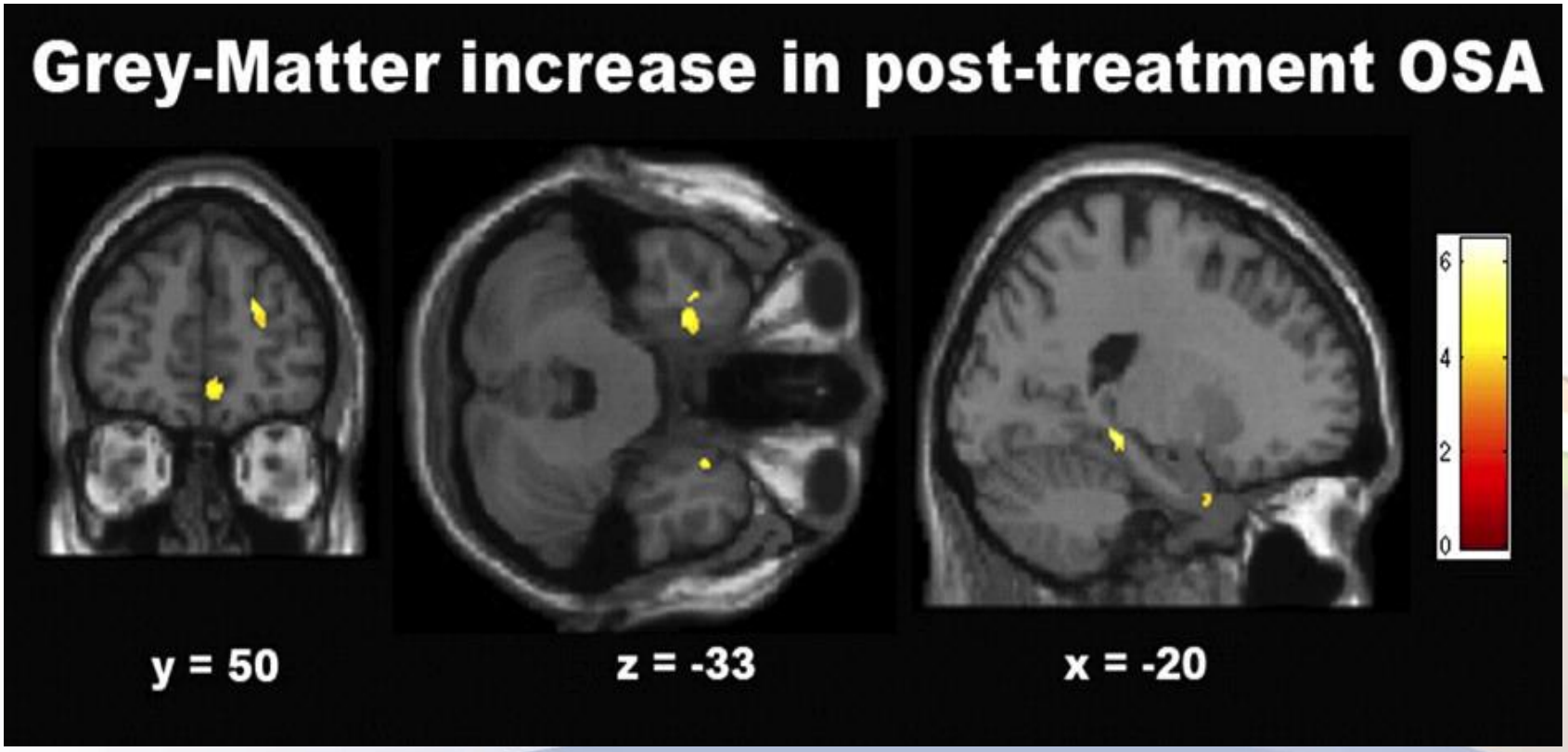
Draganski et al. J Neurosci 2006; 26:6314–7

Learning to Play Golf Grows Your Cortex



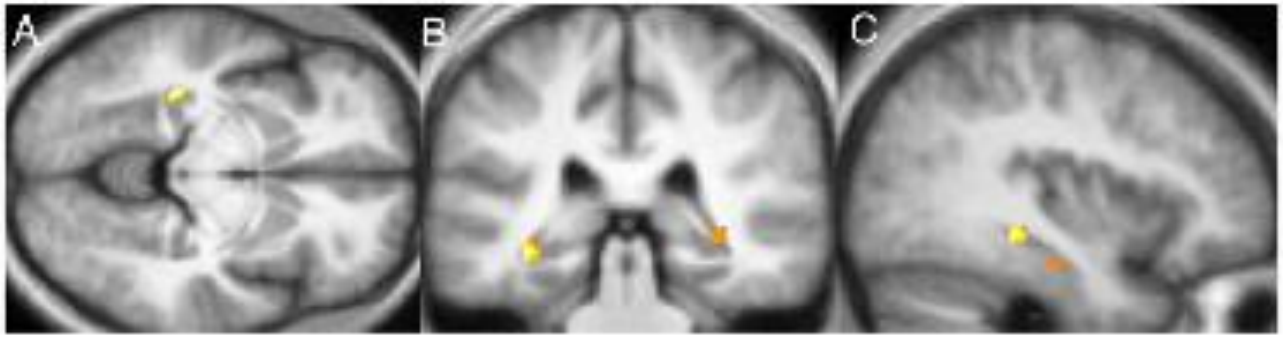
Bezzola, Landina 2009

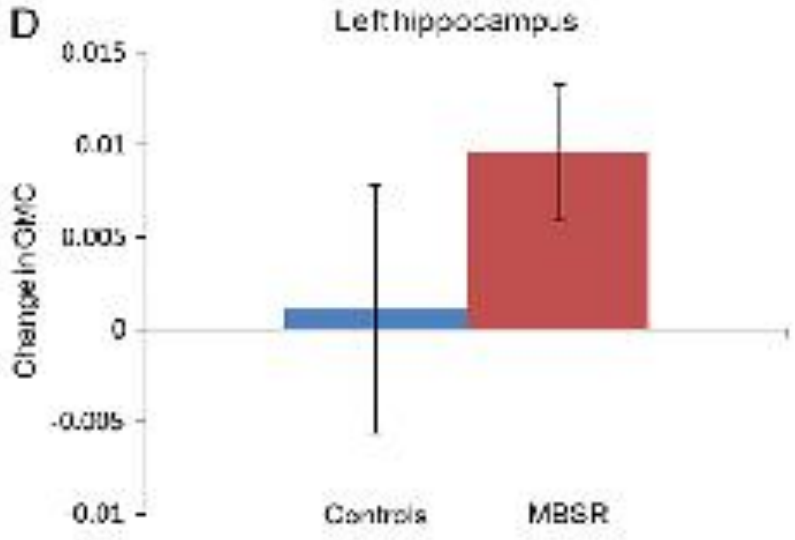
4. Better Sleep, Bigger Hippocampus



Canesa, American Journal of Respiratory Medicine, 2011

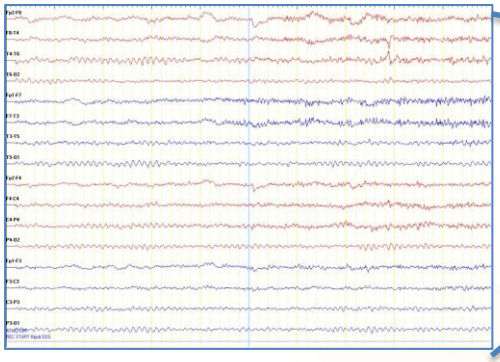
5. More Meditation, Bigger Hippocampus





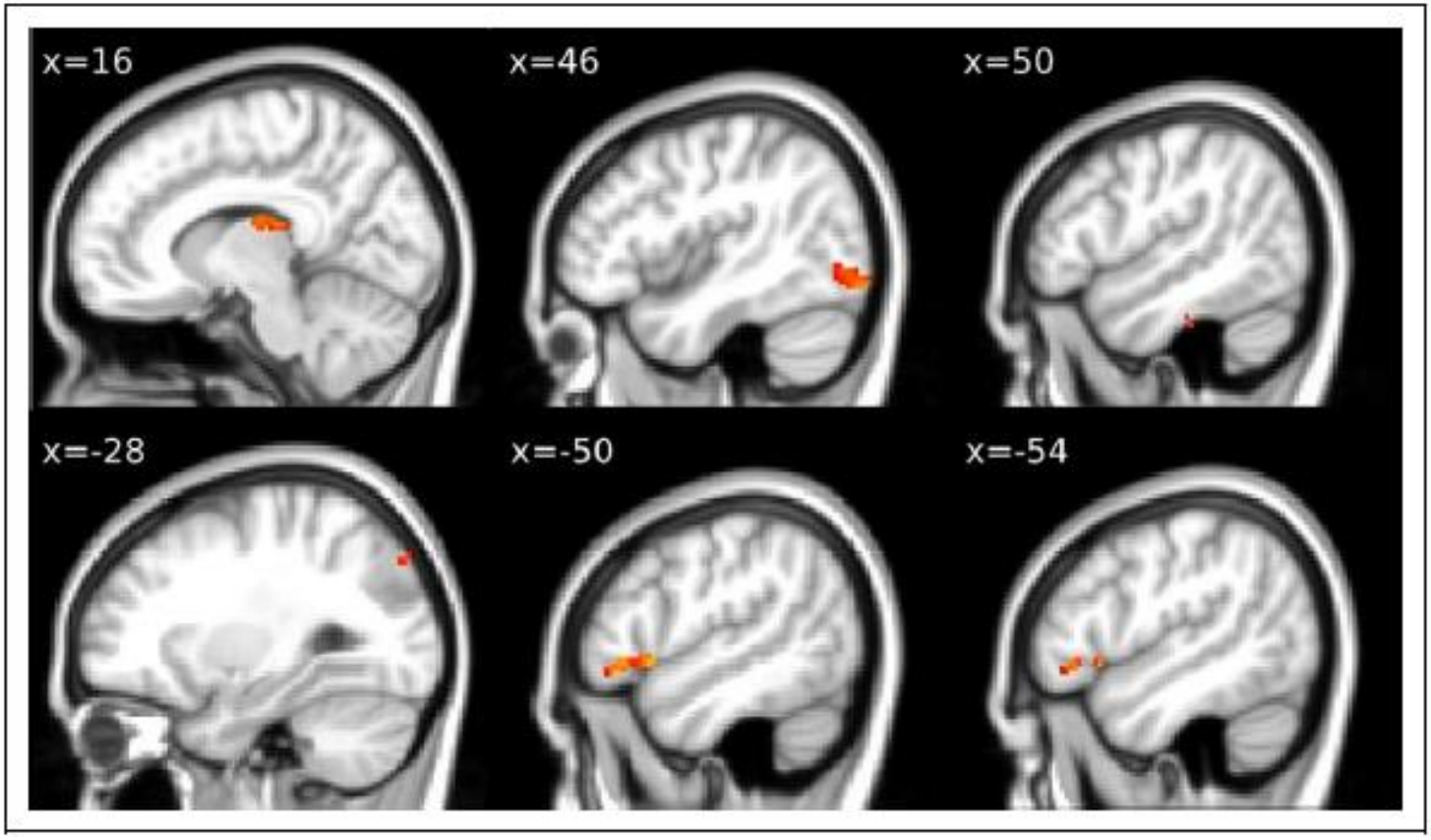
Holzel , Psychiatric Research, 2011

6. Neurofeedback Grows Your Cortex



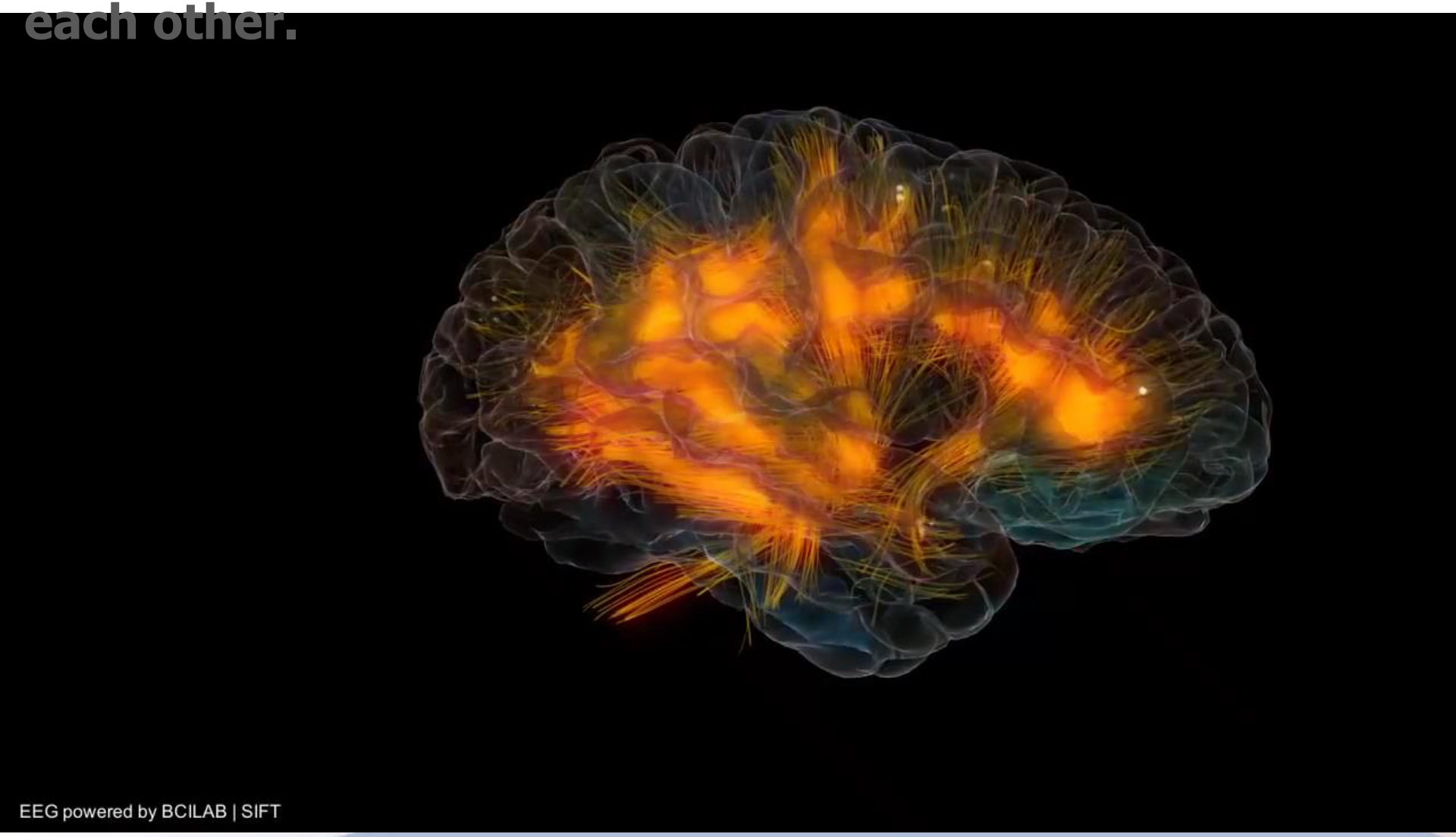
- Live EEG feedback to help you improve you brainwaves
- Helps you become more calm and focused
- The more your brain becomes organized and harmonious, the more your brain grows

Neurofeedback Grows Your Cortex



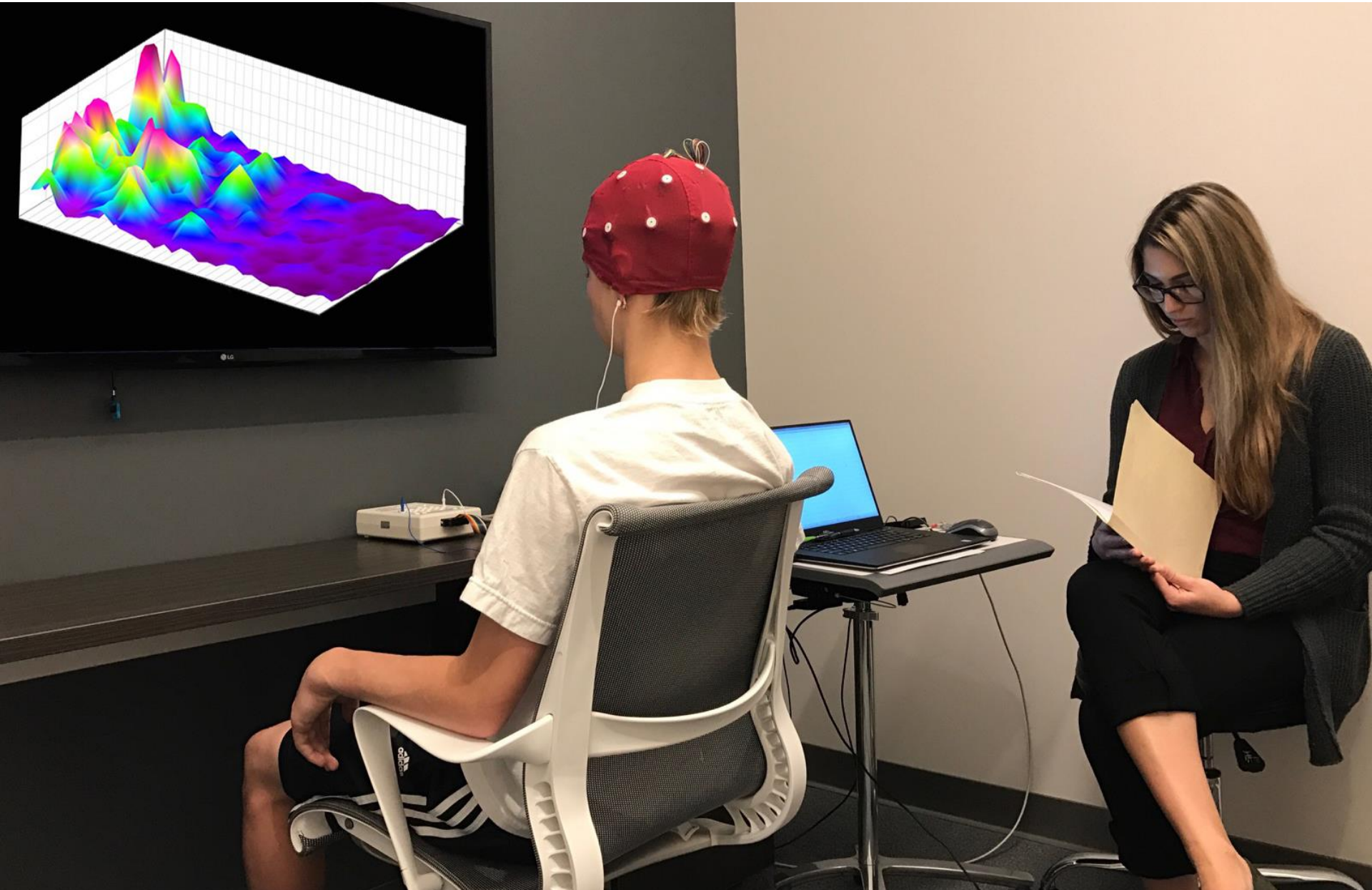
Ghaziri et al. Clin EEG Neurosci 2013; 44 (4) 265-72

Neuronal pathways use electricity to communicate with each other.



From http://neuroscape.ucsf.edu/technology/#glass-brain

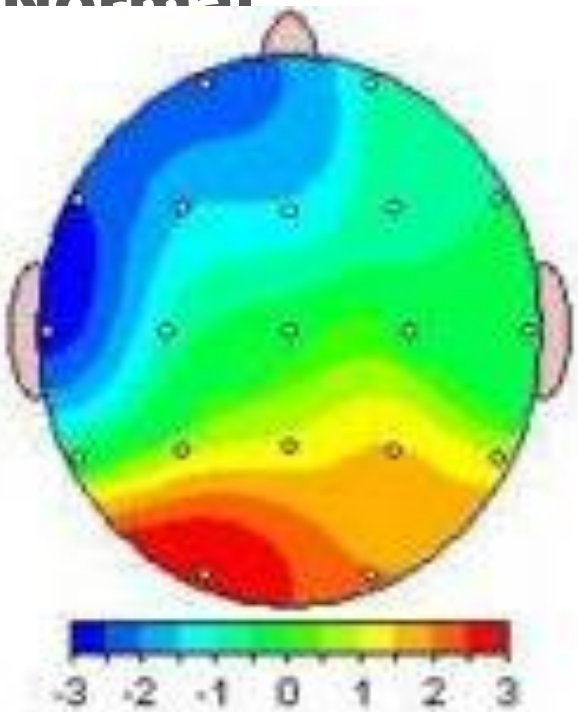
Brain Mapping – qEEG – can measure your brainwaves



Brainwave Activity:

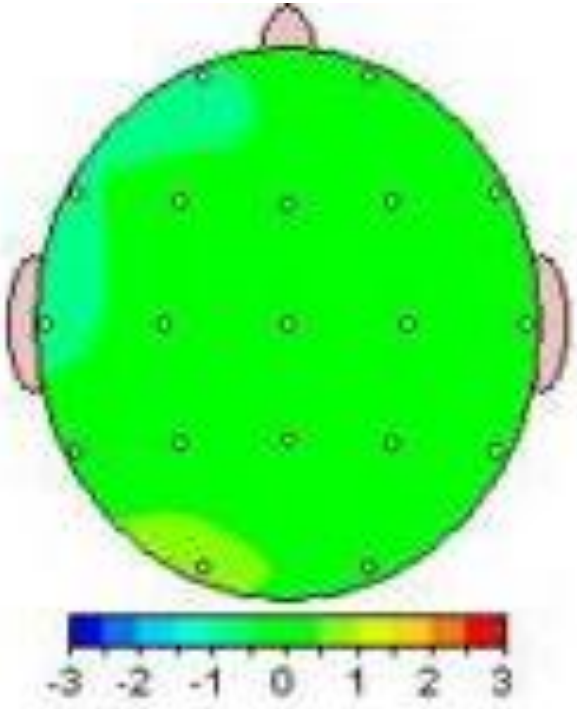
Abnormal

Normal



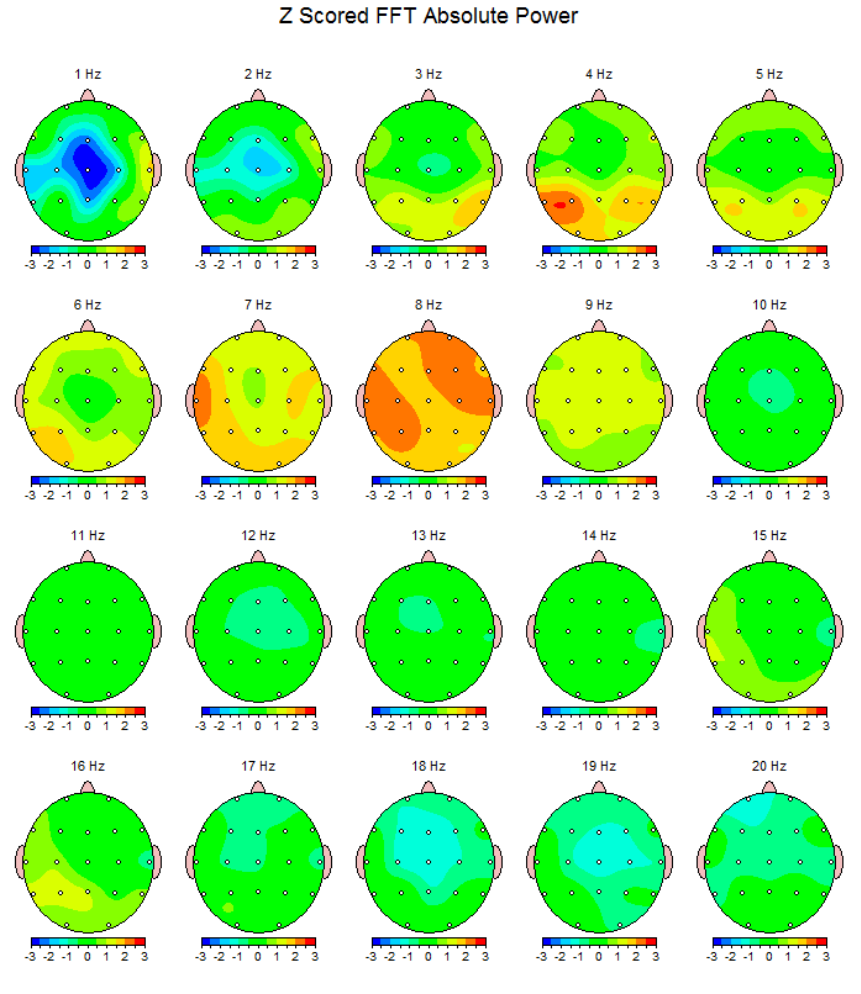
ABNORMAL ELECTRICAL ACTIVITY

RED=EXCESSIVE BLUE=DIMINISHED

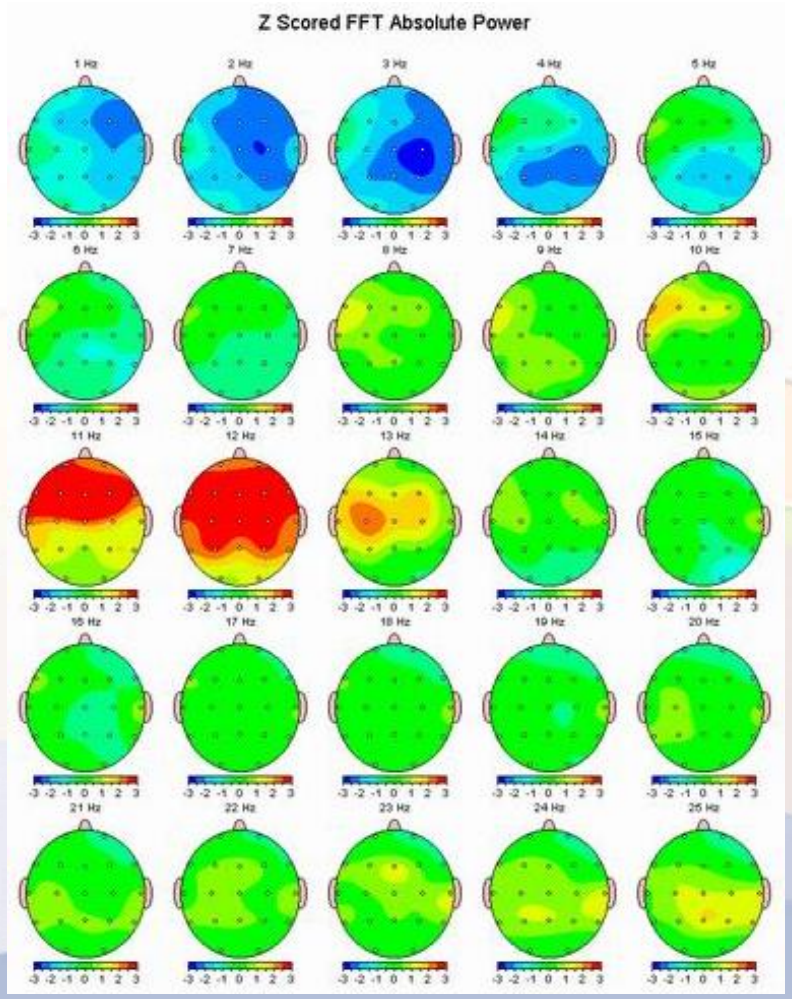


GREEN=NORMAL ELECTRICAL ACTIVITY

Patients with poor attention have abnormal brain maps:

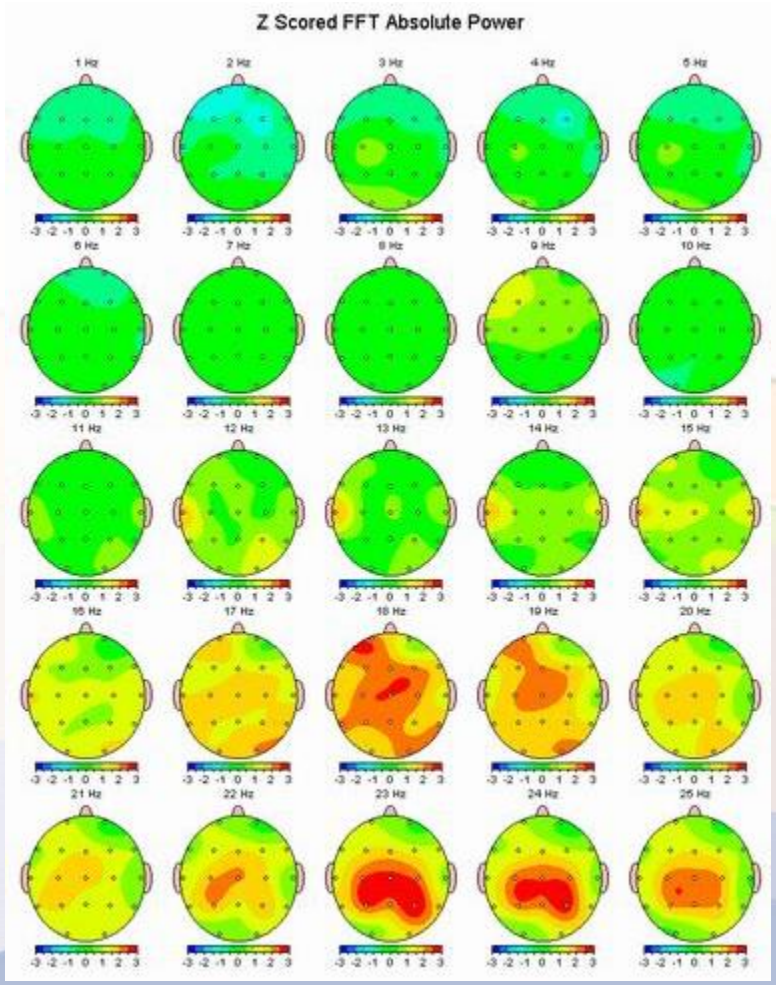


Patients with poor attention have abnormal brain maps:

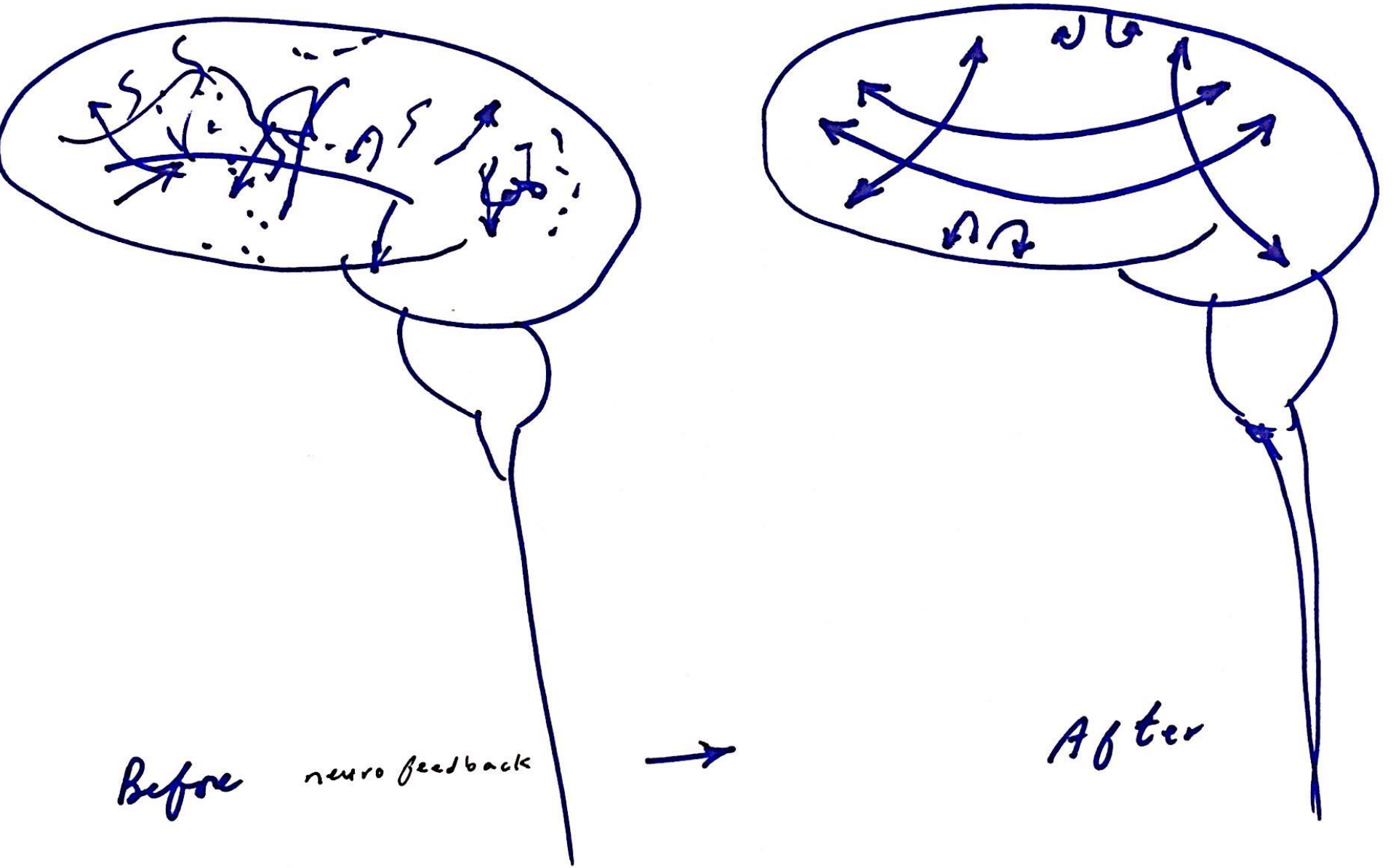


sleep and anxiety issues; difficulty paying attention

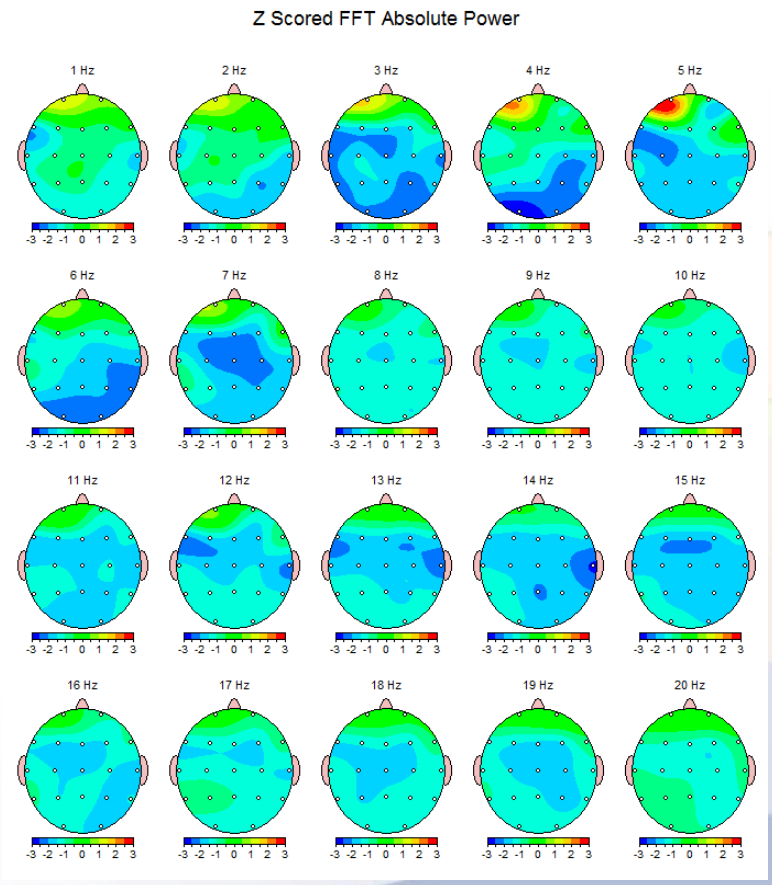
Patients with poor attention have abnormal brain maps:

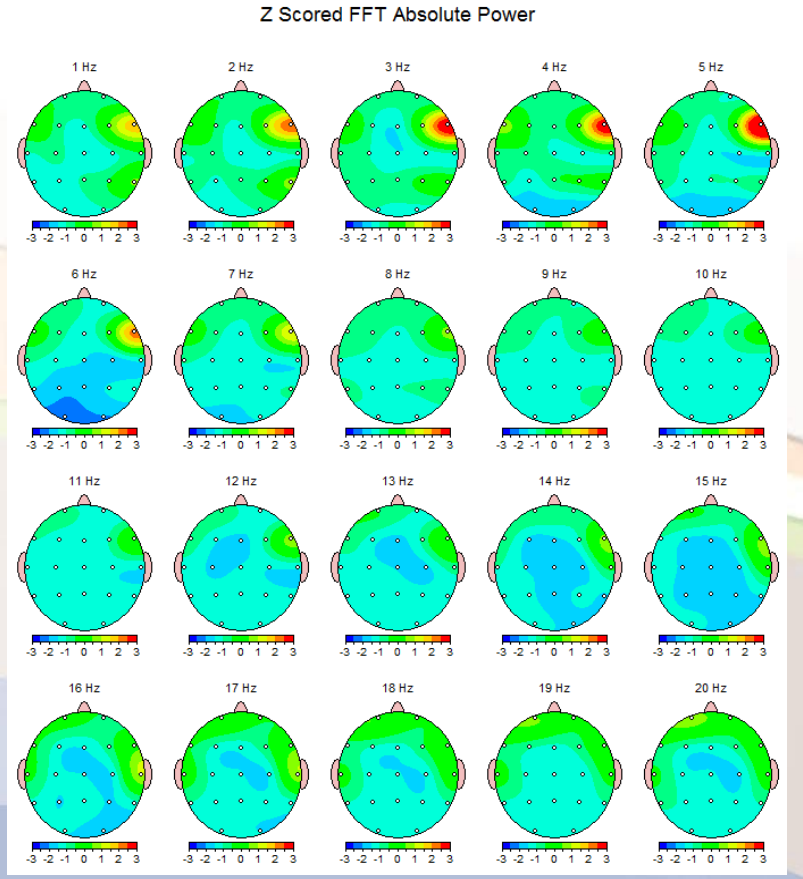


moderate to severe anxiety; not able to focus

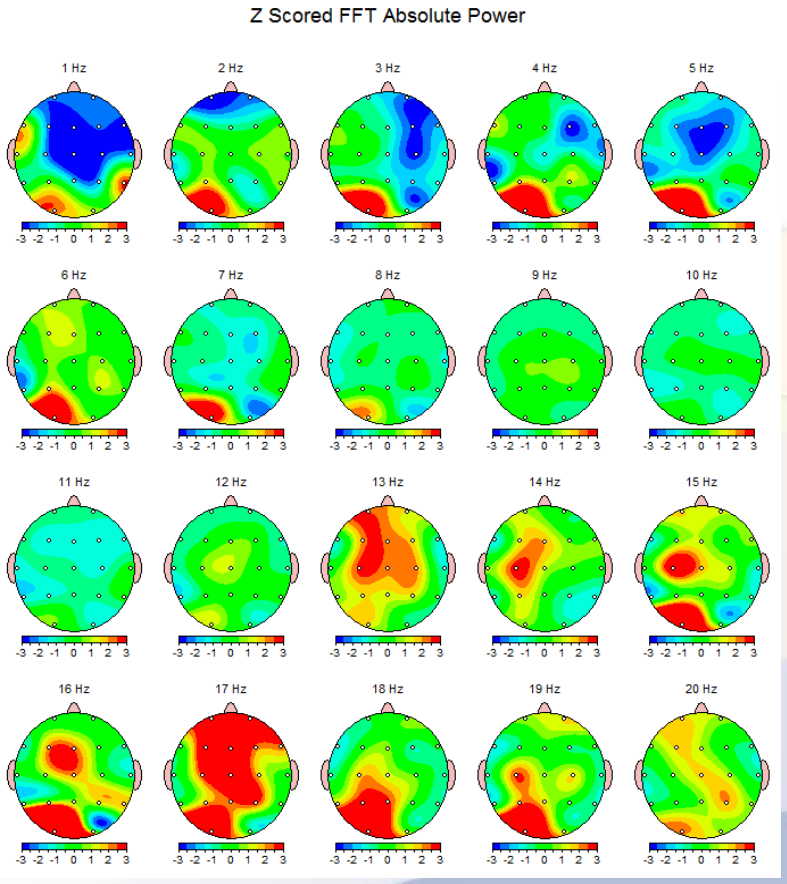

Before
neuro feedback
After

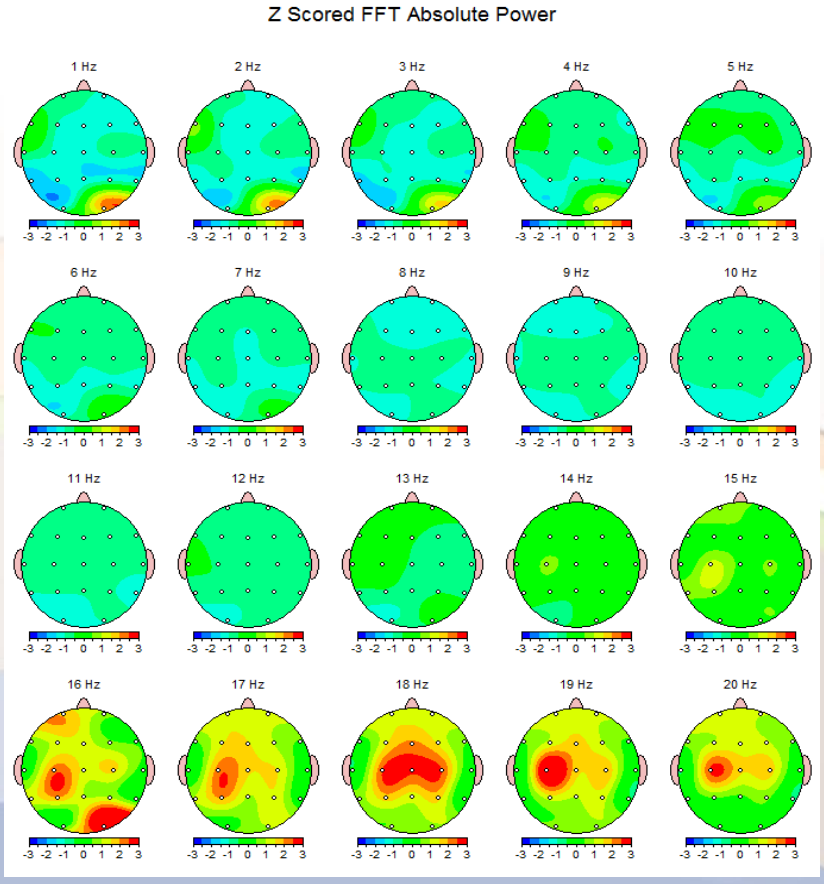
A patient with “brain fog” and sleep problems after receiving chemotherapy (chemo brain)





A patient with migraines, stress, anxiety and insomnia





Neurofeedback Research: Clinical Depression Outcomes[1]

91% of these Clients Improved[2]

51% no longer had depression.

[1]After 20 hours of neurofeedback + HRV training.
[2]Reduction in presence and/or frequency of one or more symptoms.
[3]Non-Clinical includes Normal and Borderline status.
Clinical Status (n=294) (P<.0001)

Neurofeedback Research: Anxiety Outcomes[1]

90% of these Clients Improved[2]

53% no longer had anxiety.

[1]After 20 hours of neurofeedback + HRV training.
[2]Reduction in presence and/or frequency of one or more symptoms.
[3]Non-Clinical includes Normal and Borderline status.
Clinical Status (n=251) (P<.0001)

Neurofeedback Research: ADHD Outcomes[1]

90% of these Clients Improved[2]

53% no longer had ADHD.

[1]After 20 hours of neurofeedback + HRV training.
[2]Reduction in presence and/or frequency of one or more symptoms.
[3]Non-Clinical includes Normal and Borderline status.
Clinical Status (n=251) (P<.0001)

Hippocampus Grows Bigger When You Start Early

Objectives

1. Basic Anatomy of Memory, Attention, and Decision Making
2. Effects of Aging on Your Brain
3. Six Ways to Sharpen Your Brain
4. Brain Fitness Program

Published in

Journal of Prevention of Alzheimer's Disease

The Journal of Prevention of Alzheimer's Disease - JPAD©

A Personalized 12-week "Brain Fitness Program" for Improving Cognitive Function and Increasing the Volume of Hippocampus in Elderly with Mild Cognitive Impairment

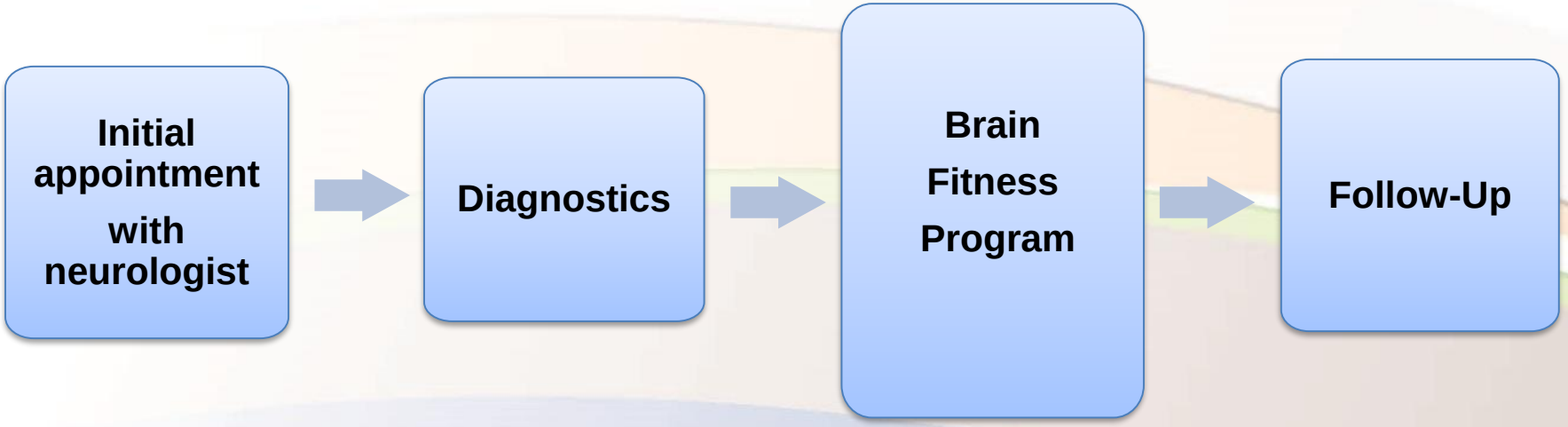
M. Fotuhi[1,2], B. Lubinski[1,3], N. Hausterman[1,4], T. Riloff[1], M. Hadadi[5], C.A. Raji[6]

1. NeuroGrow Brain Fitness Center, McLean VA 22102, USA; 2. Johns Hopkins Medicine, Howard County General Hospital, Columbia MD 21044, USA; 3. University of Maryland School of Medicine, Baltimore MD 21201, USA; 4. Argosy University, Washington DC 22209, USA; 5. Johns Hopkins Bloomberg School of Public Health, Baltimore MD 21215, USA; 6. University of California Los Angeles, Los Angeles CA 90095

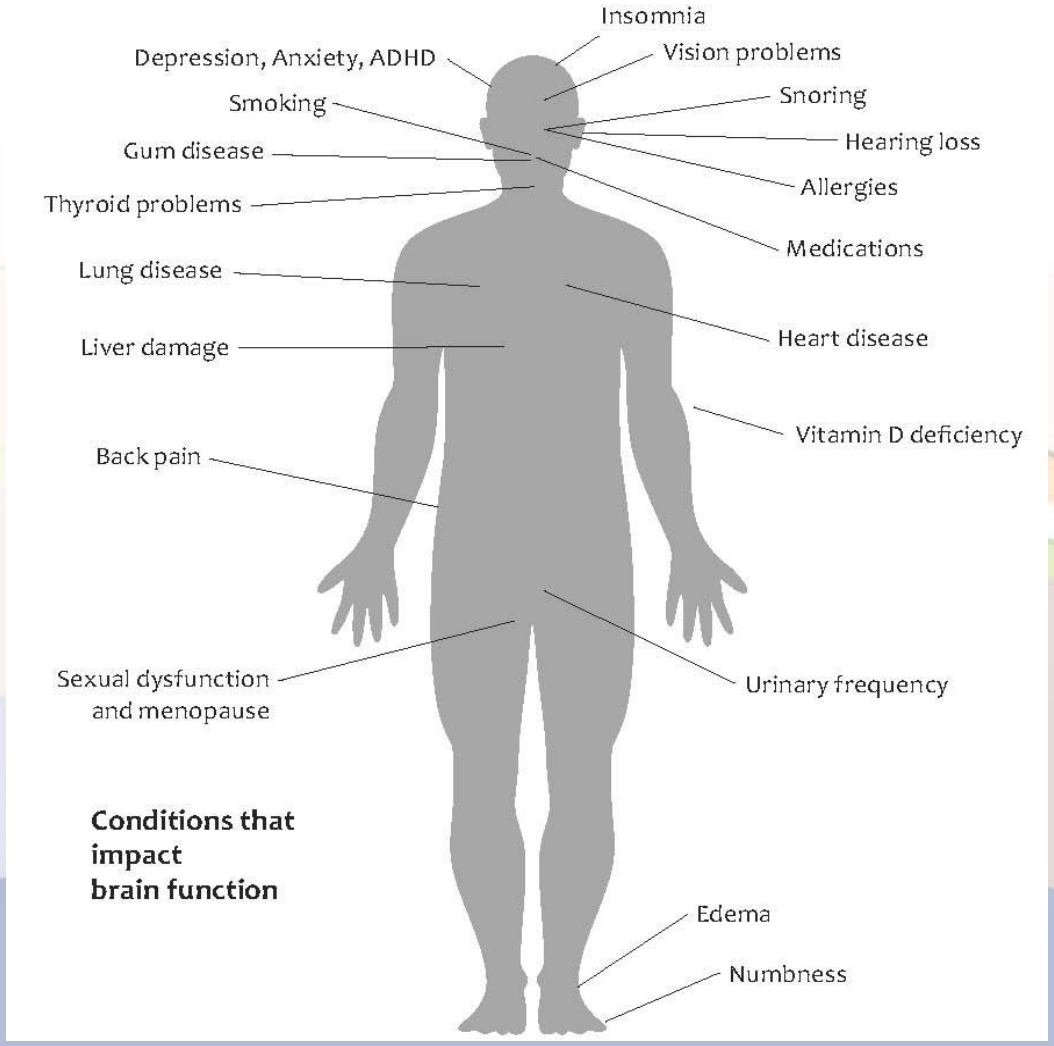
Corresponding Author: Majid Fotuhi, MD, PhD, Medical Director, NeuroGrow Brain Fitness Center, Affiliate Staff, Johns Hopkins Medicine, 8280 Greensboro Drive, suite 240, McLean, VA 22102, Phone: 703.462.9296, Fax: 703.462.9269, E-mail: mfotuhi@jhu.edu

J Prev Alz Dis 2016;in press
Published online February 8, 2016, http:/ / dx.doi.org/ 10.14283/ jpad.2016.92

Brain Fitness Program: Overview



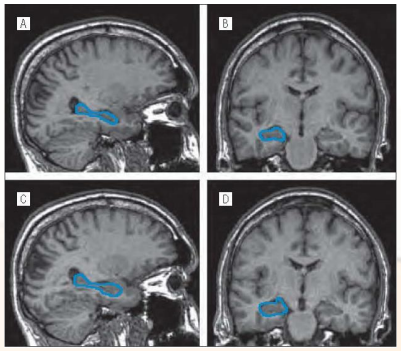
Brain Fitness Program: Initial Exam



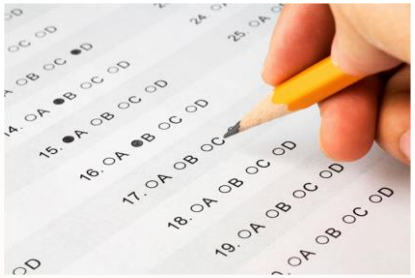
Brain Fitness Program: Comprehensive Diagnostic Tests

Cardiopulmonary Testing

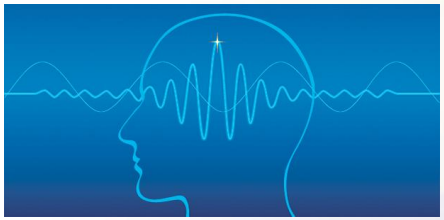
Brain MRI



Neurocognitive Evaluation



Brain Mapping qEEG



Carotid Ultrasound

Blood Test

Sleep Health Assessment

Brain Fitness Program:
A Personalized Set of Interventions

Brain Coaching and Counseling

Cognitive Skills Training

Neurofeedback Training

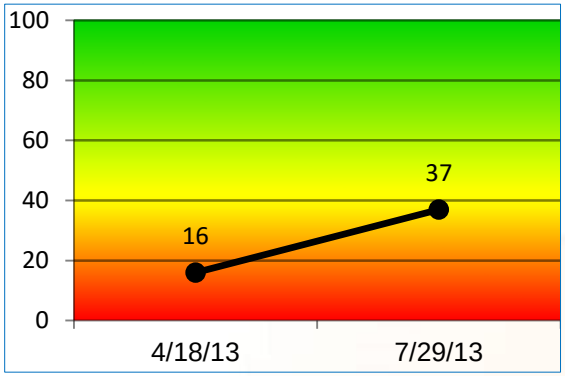
Brain-healthy Diet Counseling

Exercise Training

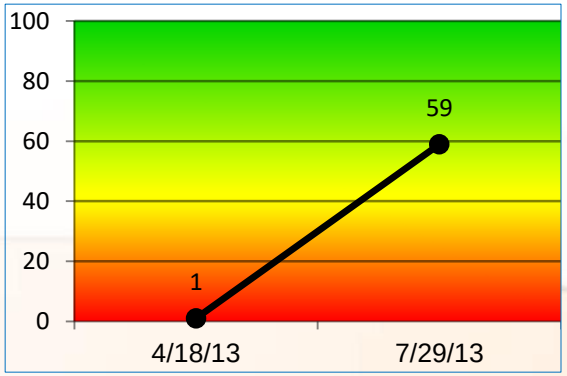
Weekly Monitoring

Brain Fitness Program:
One example: 69 year old with ?Alzheimer's

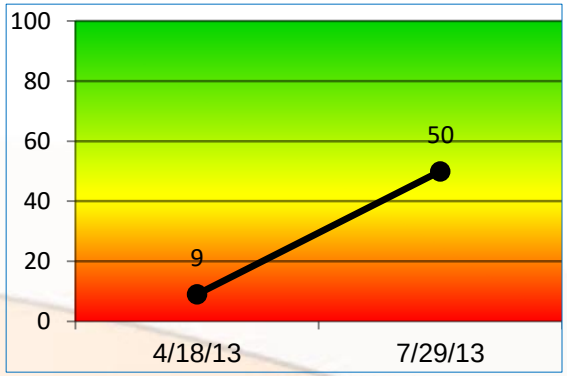
Memory



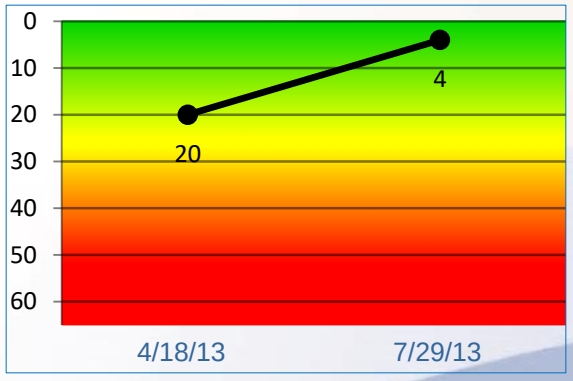
Attention



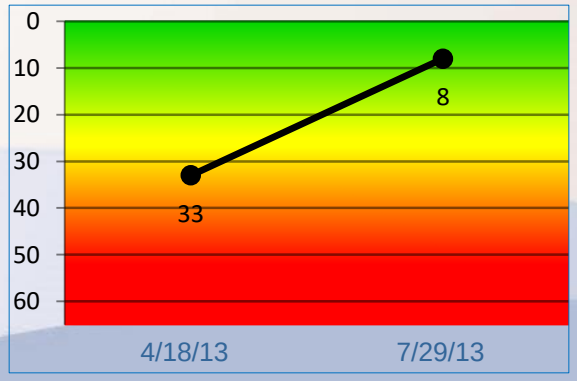
Concentration



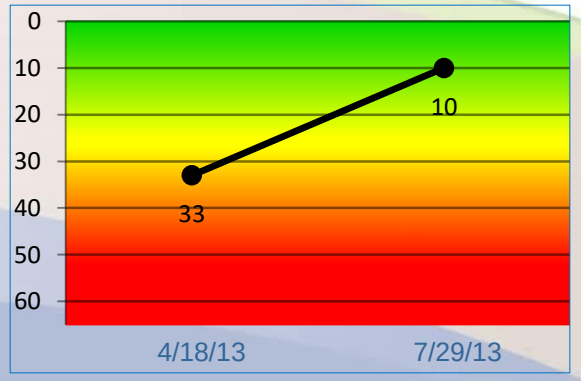
Mood



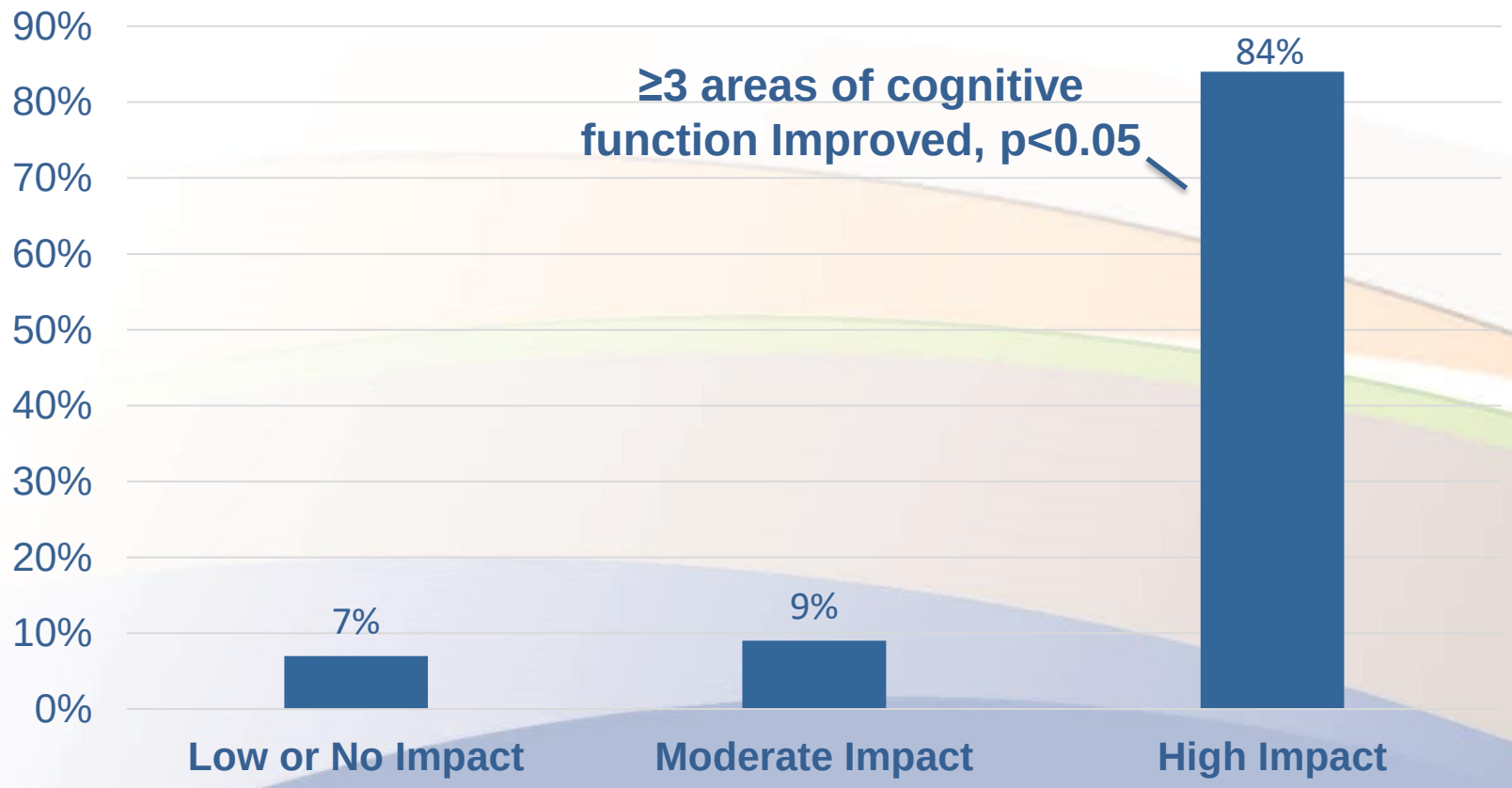
Decision Making



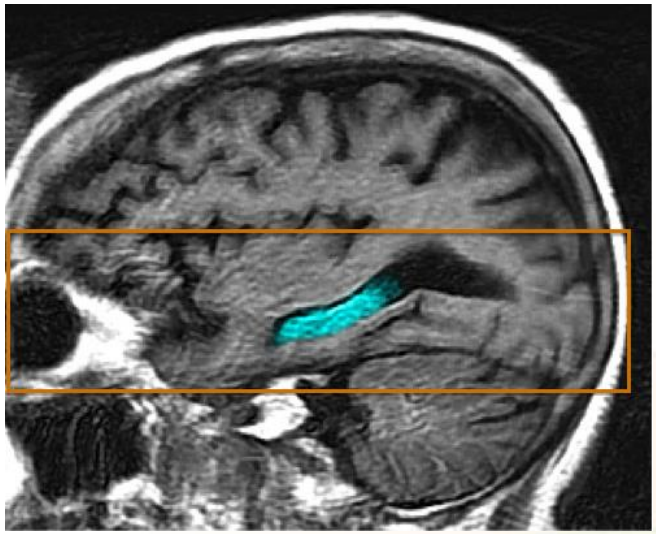
Executive Funtion



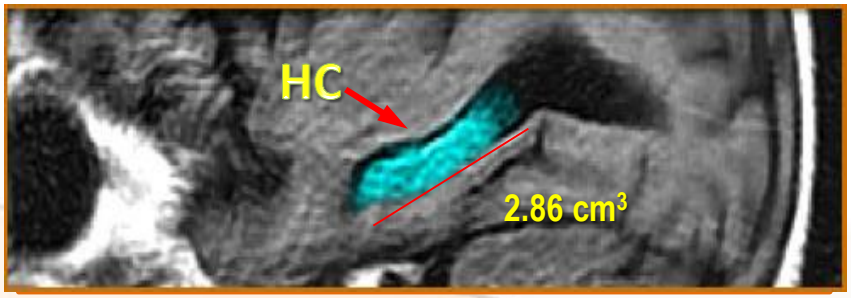
Brain Fitness Program:
Statistical Analysis of 127 Patients with MCI

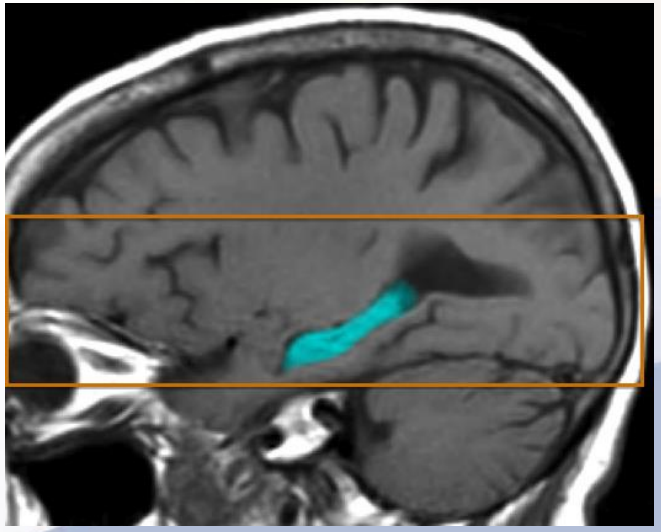


MRI Results

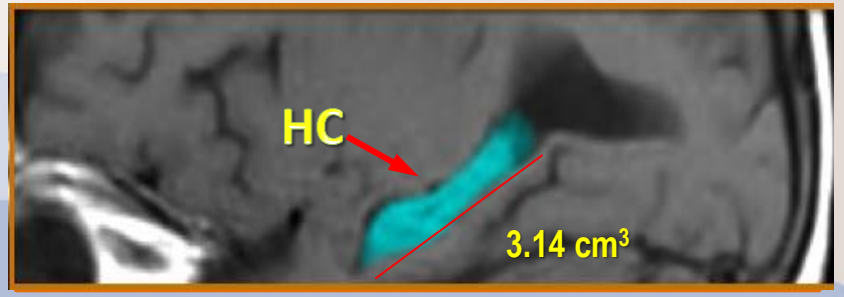


Before

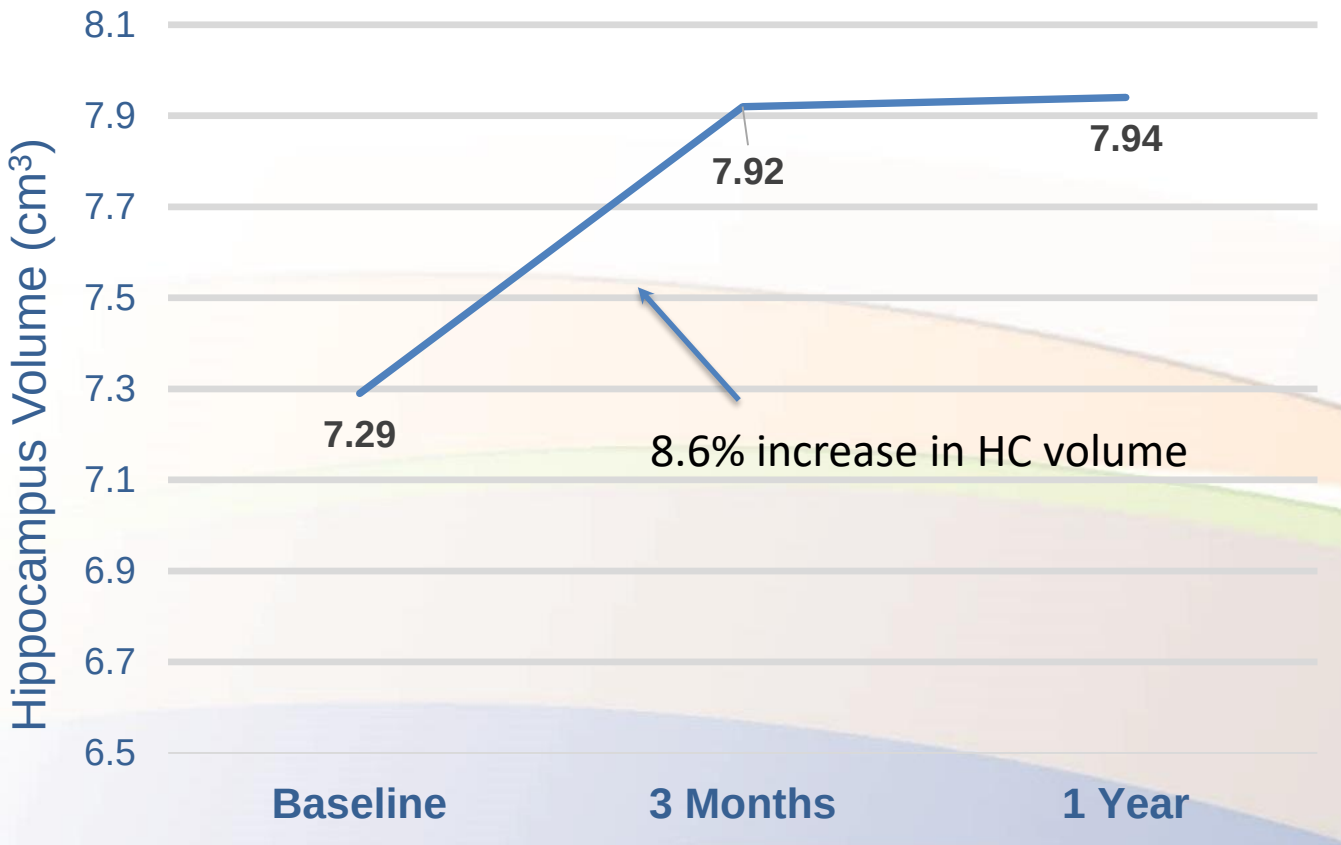




After



Sustained Benefits



Diabetes
Hypertension
Obesity
Sleep Apnea
Head Trauma
Genes
Stress

Brain-healthy Diet
Physical Fitness
Cognitive Stimulation
Meditation & Sleep

THANK YOU

MFOTUHI@NEUROGROW.COM

WWW.NEUROGROW.COM
703.462.9296

TYSONS CORNER


Spring Hill Rd
Leesburg Pike
International Dr
Westpark Dr
Tysons Blvd
Westbranch Dr
Jones Branch Dr
Dr. Majid Fotuhi, MD PhD
NeuroGrow Brain Fitness Center
Forrester Research Inc
Gosnell Rd
Tyspring St
Pike 7 Plaza
Galleria Dr
Greensboro M
Tysons Corner
Tysons Corner M
Pinnacle Dr
Tysons
7
123
Tysons Corner Center
495
Old
46B
47A