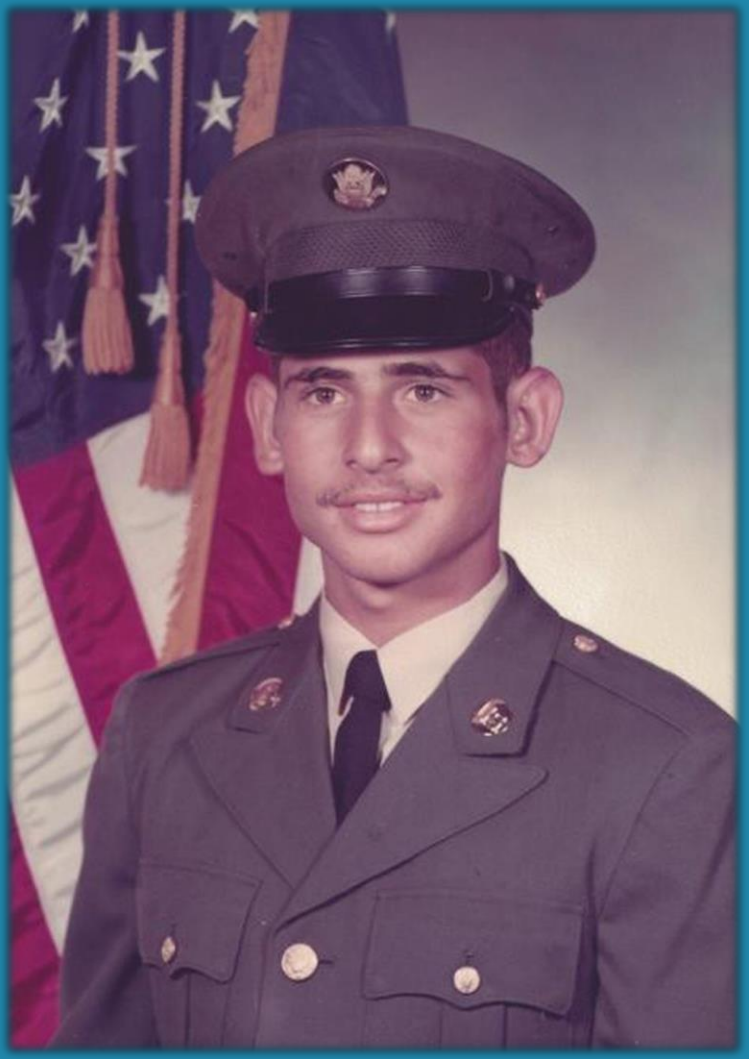
Neuroimaging Changes Everything: How Do You Know Unless You Look?

Maverick

Courtesy Amen Clinics, Inc. www.AmenClinics.com

1972…



How do you know unless you look?

Courtesy Amen Clinics, Inc. www.AmenClinics.com

1979 …

Fell in love with psychiatry because it has potential to change generations

1991 …

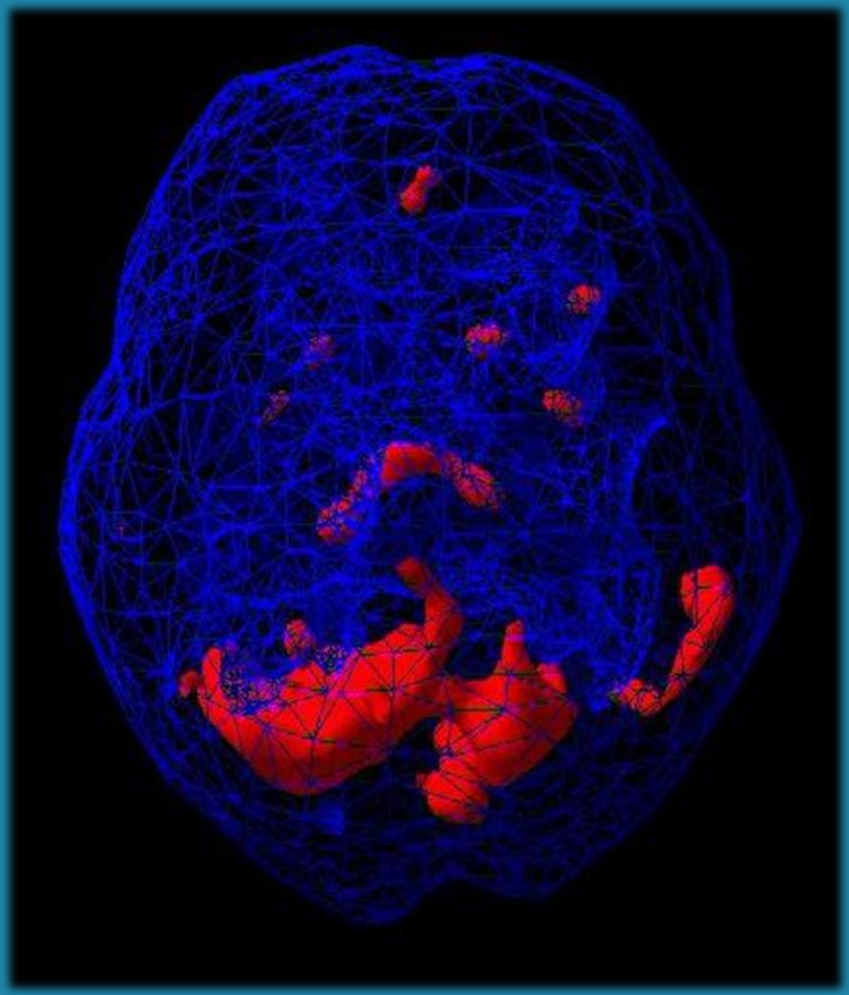
Brain SPECT Imaging

+ Psychiatry

= Revolution

Healthy Brain SPECT Scans

Surface View

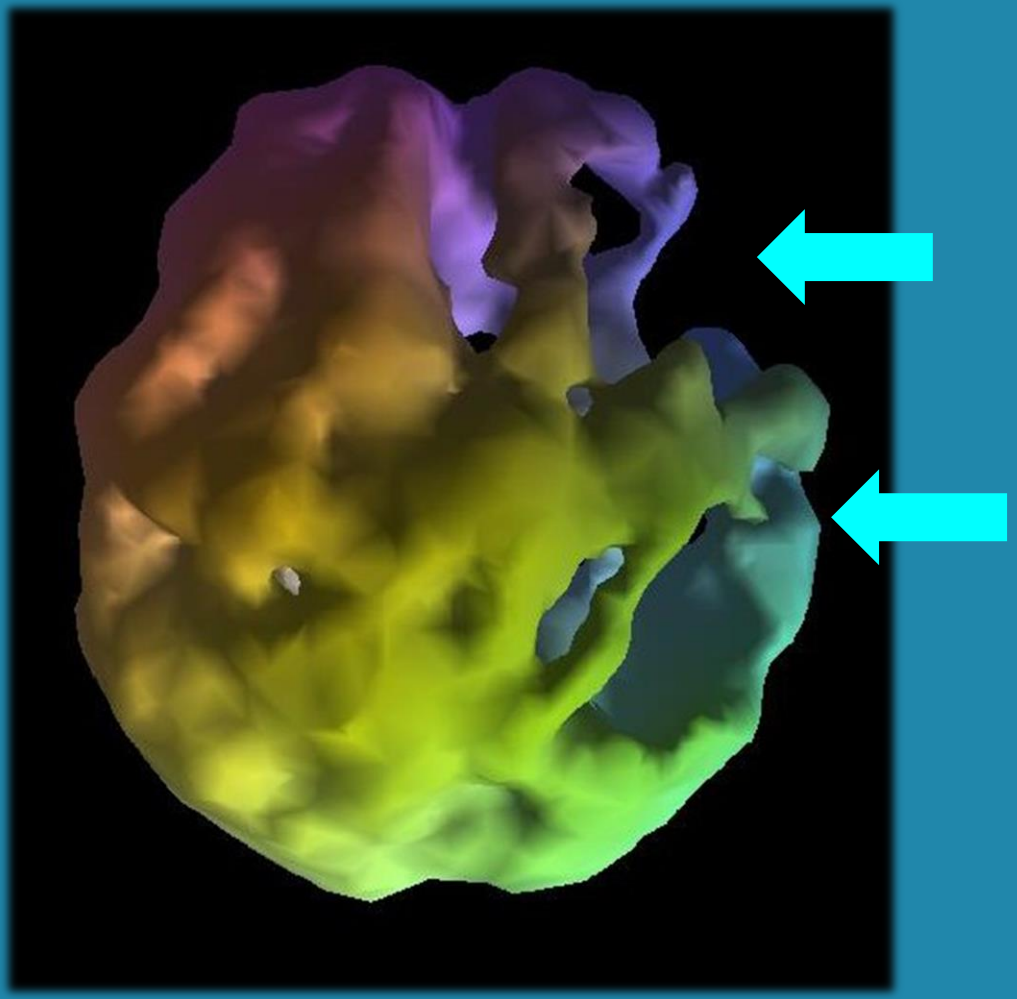


Active View

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Healthy vs. 2 Strokes

Healthy

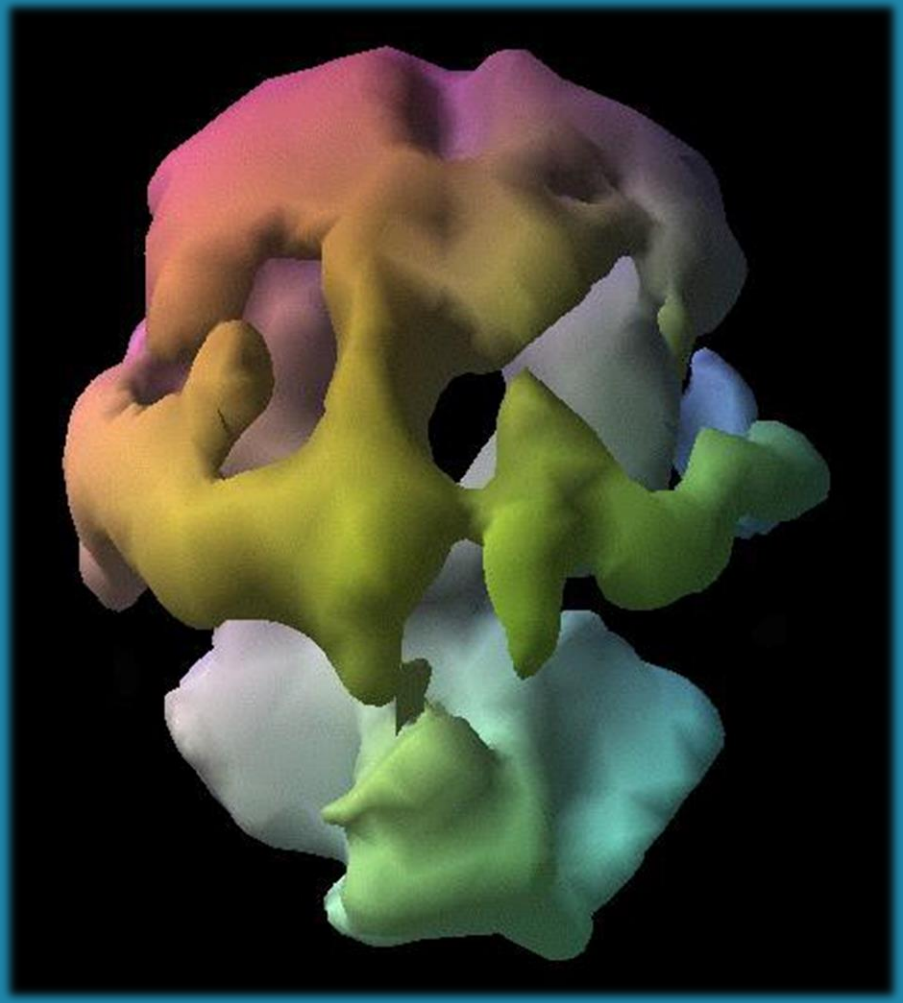


Stroke

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Healthy vs. Alzheimer's Disease

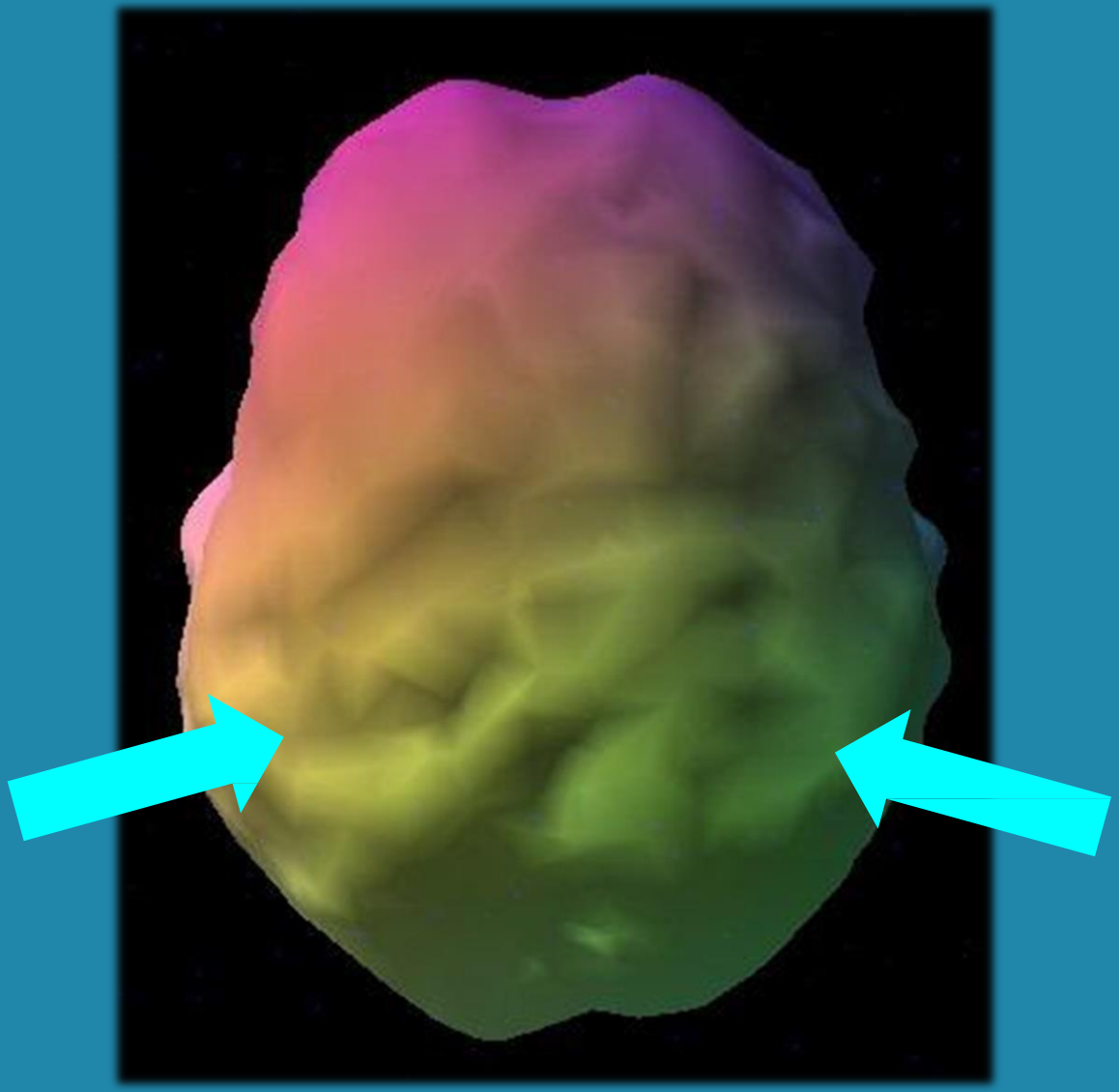
Healthy



Alzheimer's

Courtesy Amen Clinics, Inc. www.AmenClinics.com

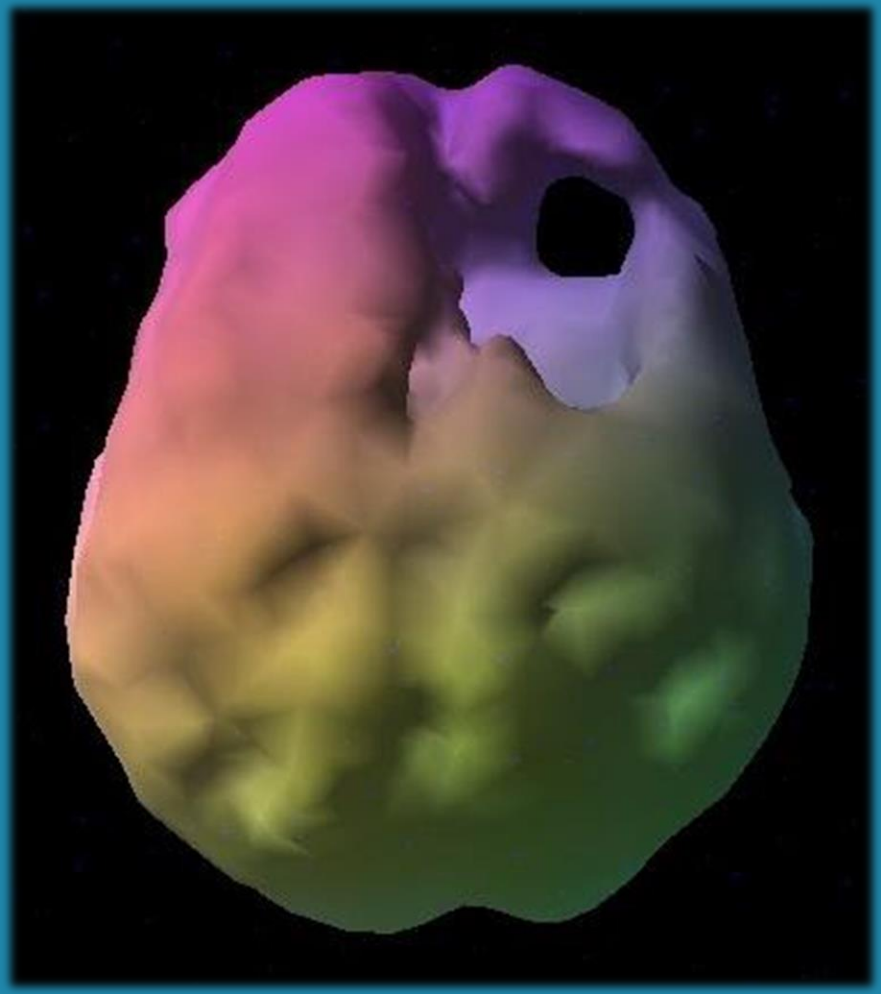
Matilda's Scan



Courtesy Amen Clinics, Inc. www.AmenClinics.com

Healthy vs. Traumatic Brain Injury

Healthy

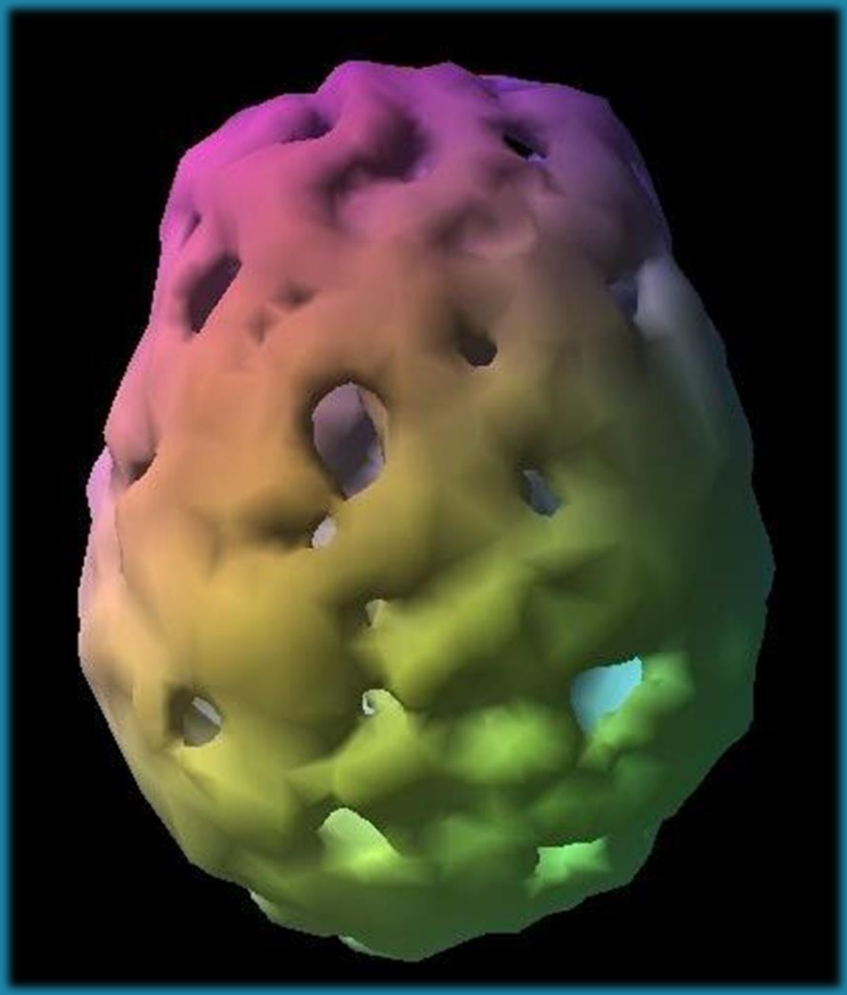


TBI

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Healthy vs. Drug Abuse

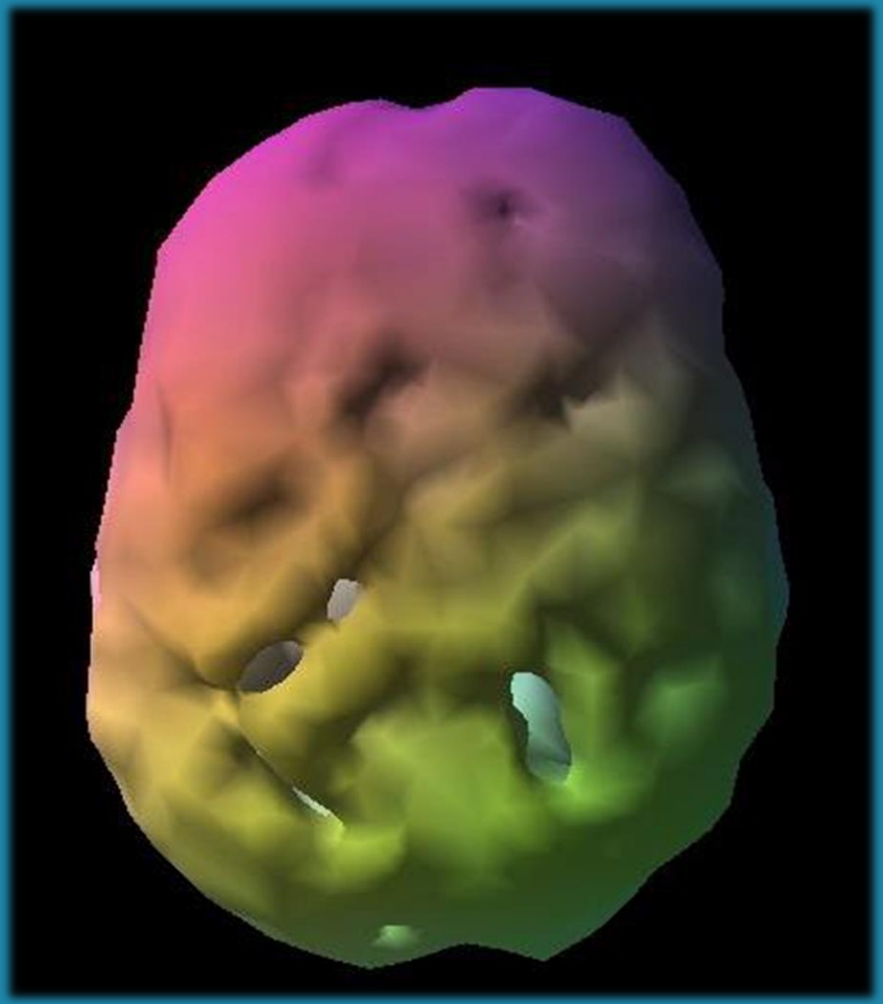
Healthy



Drug Affected

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Ken



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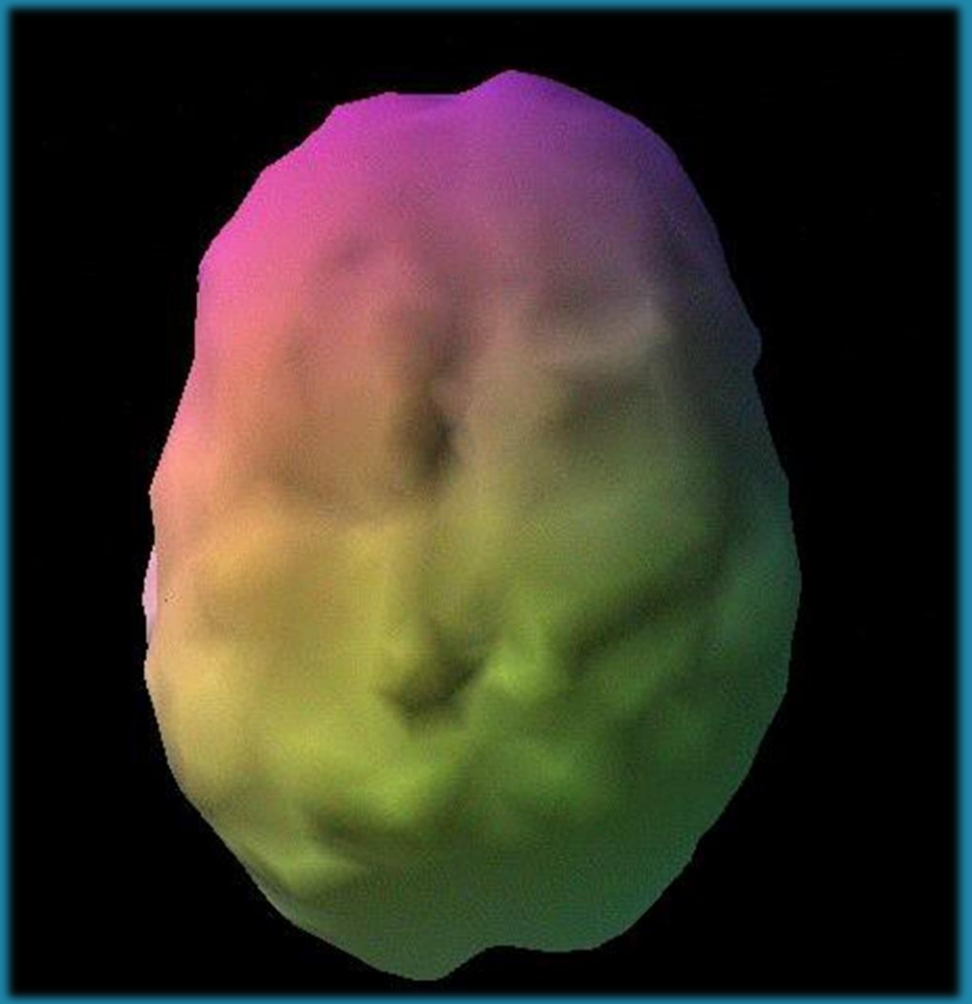
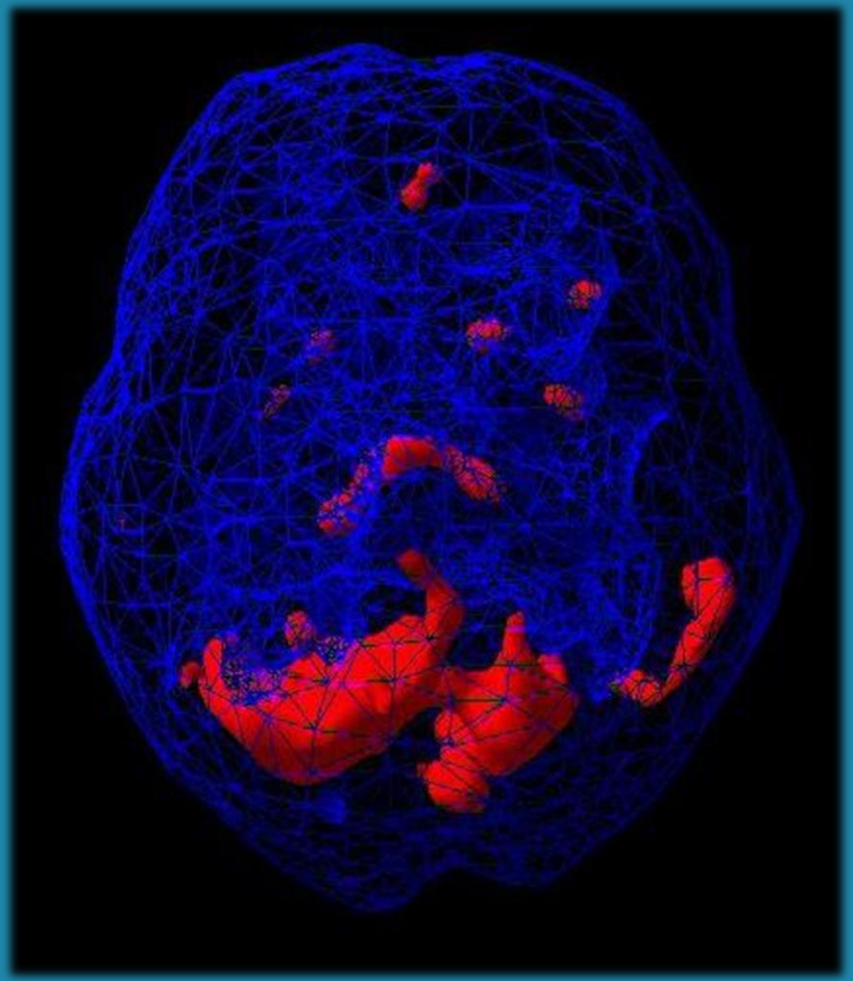


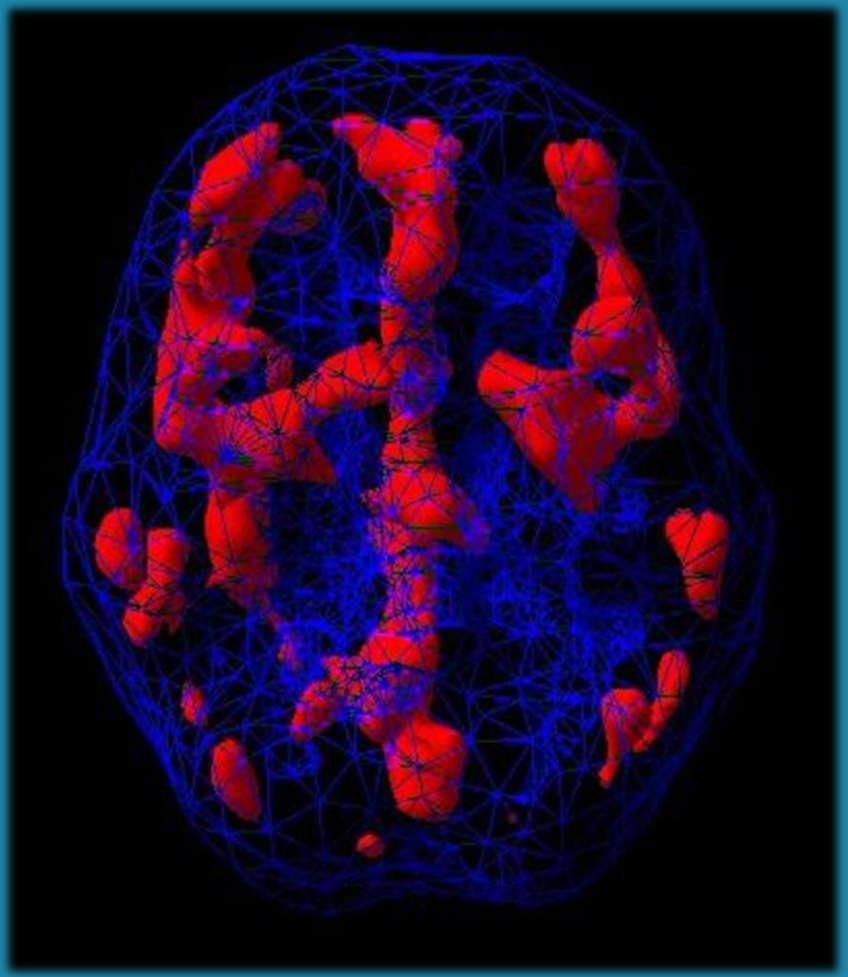
After

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Healthy vs. OCD



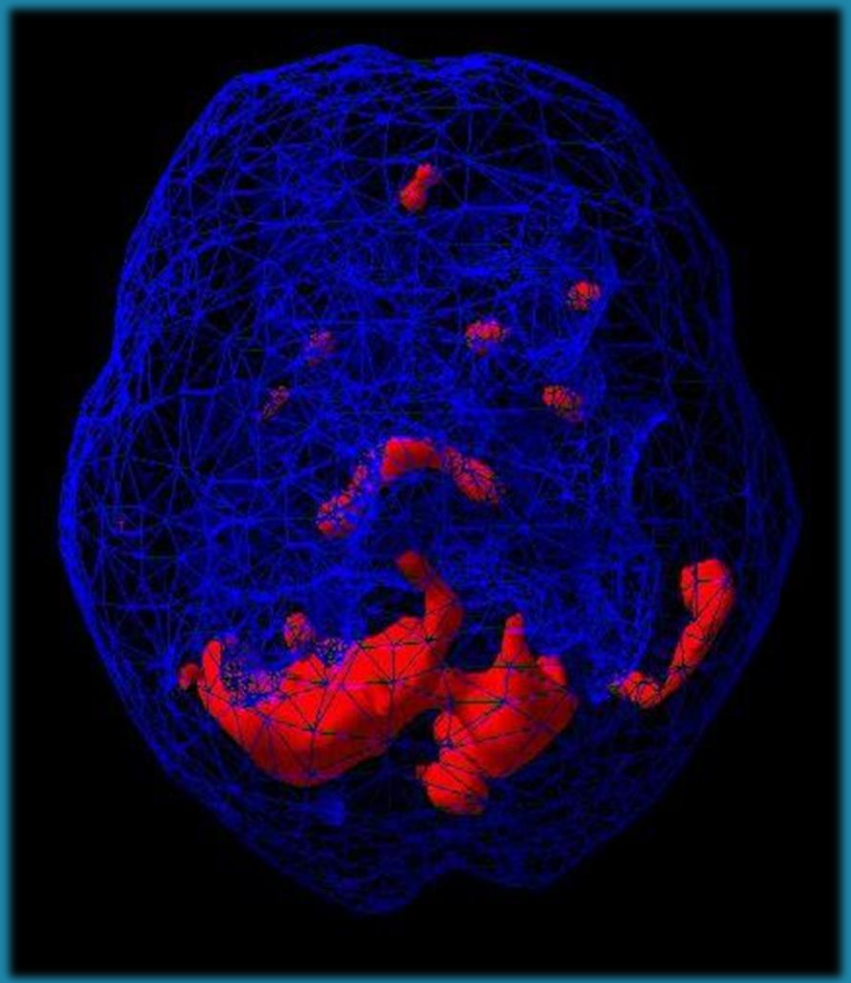
Healthy

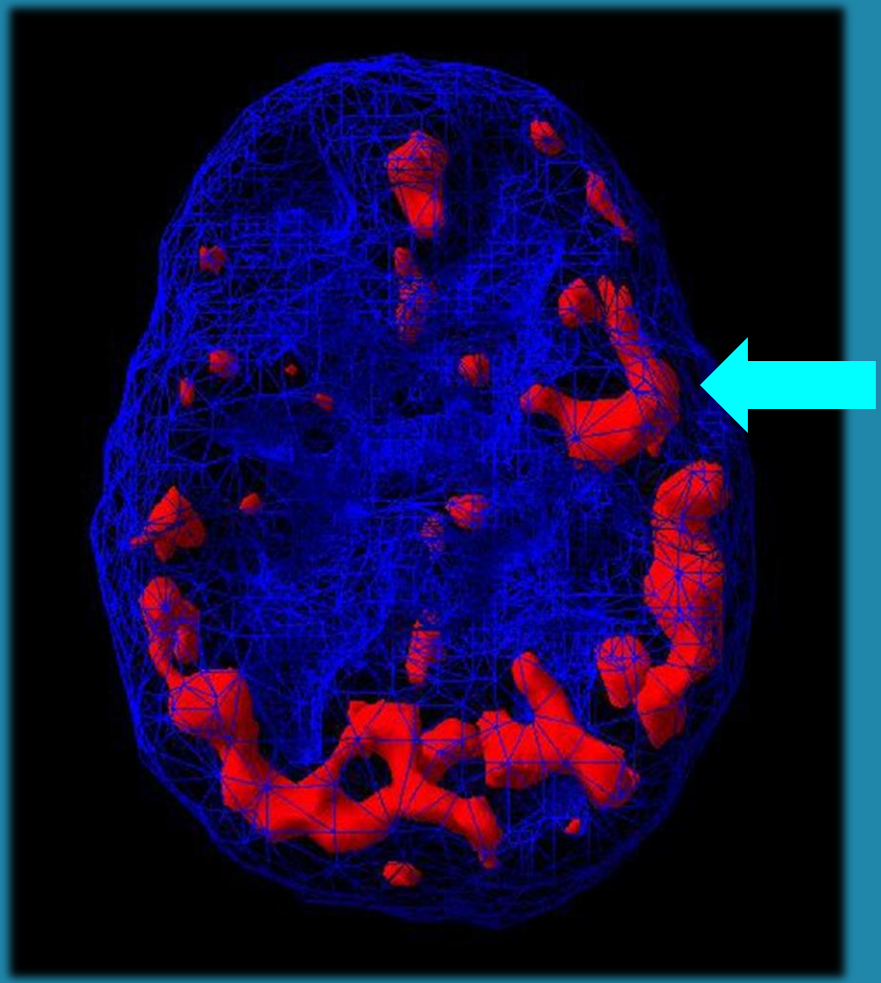


OCD

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Healthy vs. Seizure Activity





Healthy

Seizure Activity

Courtesy Amen Clinics, Inc. www.AmenClinics.com

1992 …

All Day Conference on SPECT in Psychiatry

Researchers Complain Scans Only for Research

Without Imaging

- Diagnoses still made similar to how Lincoln was diagnosed with depression in 1840
- DSM is hurting us, because it is not based on underlying physiology
- Giving someone diagnosis of depression is like giving diagnosis of chest pain

Psychiatrists are the Only Medical Specialists Who Rarely Looks at Organs They Treat

- Cardiologists look
- Neurologists look
- Orthopedists look
- All other specialties look
- Psychiatrists guess





Before Imaging

Courtesy Amen Clinics, Inc. www.AmenClinics.com

There is a Reason Most Psychiatric Medications Have "Black Box" Warnings

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Current Clinical DSM Psychiatric Model

Symptoms	Diagnosis	Treatment
Depression 6 of 9 sxs	Depression	Antidepressants
Anxiety	Anxiety Disorder	Anti-anxiety meds
Attention 6 of 9 sxs for inattention, 6 of 9 for hyper/impulsivity	ADHD	Stimulants
Explodes Intermittently	Intermittent Explosive Disorder I.E.D.	Anger management ? meds

It's Not Working Very Well! Psychiatric Outcomes Have Not Improved in Decades

- **Insel, NIMH, *"The unfortunate reality is that current medications help too few people to get better and very few people to get well."*****
- **Antidepressants effects are similar to placebo, except for severely depressed***
- **Antipsychotics and stimulants no more effective than in 1954**
- **Taking multiple psych meds is linked to suicide***

Insel, T: Disruptive Insights in Psychiatry: Transforming a Clinical Discipline. Journal of Clinical Investigation, 2009, Vol 119, #4, pgs 700-705
Kirsch: Review benefits of antidepressants over placebo limited except in very severe depression. Evid Based Ment Health 2010 May; 13(2):49.
Communication with LTC Daniel Johnston

Not Looking at the Brain Hurts Patients and Families

- **Symptom based diagnoses are misleading – many roads to depression, symptoms tell nothing of underlying**
- **Leads to one-size-fits-all treatments – no understanding of illness subtypes**
- **Often completely miss TBI, toxicity or infections – often the primary cause of psychiatric symptoms**
- **Misses that some psychiatric medications are toxic**
- **Miss a huge opportunity to ↑ stigma, ↑ compliance – What if Mental Health was Really Brain Health?**

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Not Looking at the Brain Hurts Society

- **Organizations like NFL/NHL remained in denial for decades about long-term effects of TBI – our SPECT imaging work helped them change everything**
- **Military personnel with TBI are often left without appropriate help and hope – how do you know if a TBI was significant unless you look at brain function?**
- **Costly dementias not diagnosed until late in illness even though Alzheimer's starts in the brain decades before people have any symptoms, so no prevention or early treatment can occur. Soldier TBIs are going to increase the risk for dementia. We need to stop this from happening.**

Ineffectively Treated Brain Problems are Expensive & Painful!

- Underachievement
- School failure
- Job failure
- Relationship problems
- Legal problems
- Failed therapy attempts
- Failure to successfully transition to civilian life
- Suicide is devastating
- Multiple failed med trials
- Residential treatment can cost ~$100,000 a year for troubled teens
- 28 day drug treatment is ~ $20-80,000/month Psychiatric hospital stays often > $2,000 a day
- Permanent disability is extremely costly

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Thomas Insel, Director of NIMH
APA Meeting 2005

- Trial and error diagnosis will move to an era where we understand the pathophysiology of mental disorders
- We are going to have to use neuroimaging to begin to identify the systems pathology that is distributed in each of these disorders and think of imaging as a biomarker for mental illnesses.

Thomas Insel, Director of NIMH
APA Meeting 2005

- End game is to get to individualized care.
- The DSM-IV has 100%reliability and 0% validity. We need to develop biomarkers to develop the validity of these disorders.
- Develop treatments that go after the core pathology.

Reasons We Don't Look

- Imaging is not part of our training or tradition
- Most psychiatrists do not know how to read brain scan images
- Do not know what to do with the information

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Reasons We Don't Look

- Most psychiatrists, through disuse, have forgotten their neuroanatomy and brain circuitry and rely more on the DSM-IV for diagnoses
- Most psychiatrists think brain problems must be blatantly obvious before they order scans

Reasons We Don't Look

- There are many myths and misconceptions about imaging
- Political bodies (APA/NIMH) are dragging feet about imaging and actively holding the field back

Myth: Scans Make Diagnoses

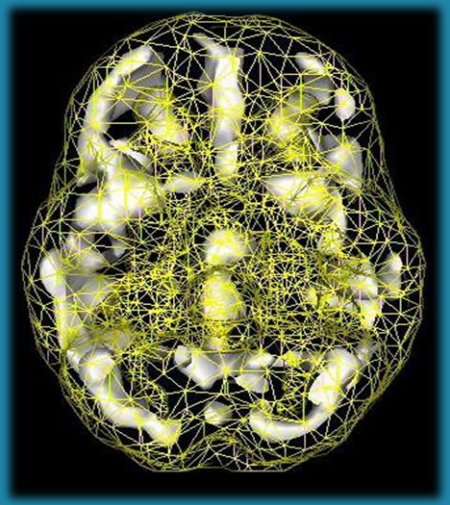
- Scans help with additional information (the BIO of a bio/psych/social/spiritual evaluation)
- Should never be used in isolation
- DSM is NOT based on underlying neuroscience and will never closely correlate with imaging
- Scans add valuable information on function or dysfunction of certain brain regions

Myth: Not Enough Research On Imaging

- Literally thousands of functional imaging articles on tens of thousands of neuropsychiatric patients
- Examples: 2,548 abstracts on amenclinics.com
  - Dementia – 210 studies on 13,261 subjects
  - ADHD – 93 studies on 2,010 subjects
  - Brain Injury – 454 studies on >5,000 subjects
  - Treatment effects – 107 studies, 2,695 subjects

Myth: Not Enough Research On Imaging

- **Examples: continued**
  - **Normal – 76 studies on 4,111 subjects**
  - **OCD – 99 studies on 2,155 subjects**
  - **Autistic spectrum disorders – 63 studies on 2,051 subjects**
  - **Epilepsy – 253 studies, 7,382 subjects**
  - **Violence – 41 studies, 1,468 subjects**



Courtesy Amen Clinics, Inc. www.AmenClinics.com

Myth: Scans Lead To Use More Medicine

- Scans helps us use more targeted medicines and less toxic medicines
- Makes you open to other treatments such as HBOT, neurofeedback and meditation
- Scans have shown psychotherapy and meditation changes brain function

Myth: Scans Are Dangerous

- Radiation of a SPECT study is about same as routine head CT scan
- Last year 20 million nuclear procedures done in the U.S., including 8,000 performed at Boston Children's Hospital
- No evidence of harm from SPECT or PET study
- Psychs are not used to ordering imaging tests so tend to be uncomfortable with any radiation

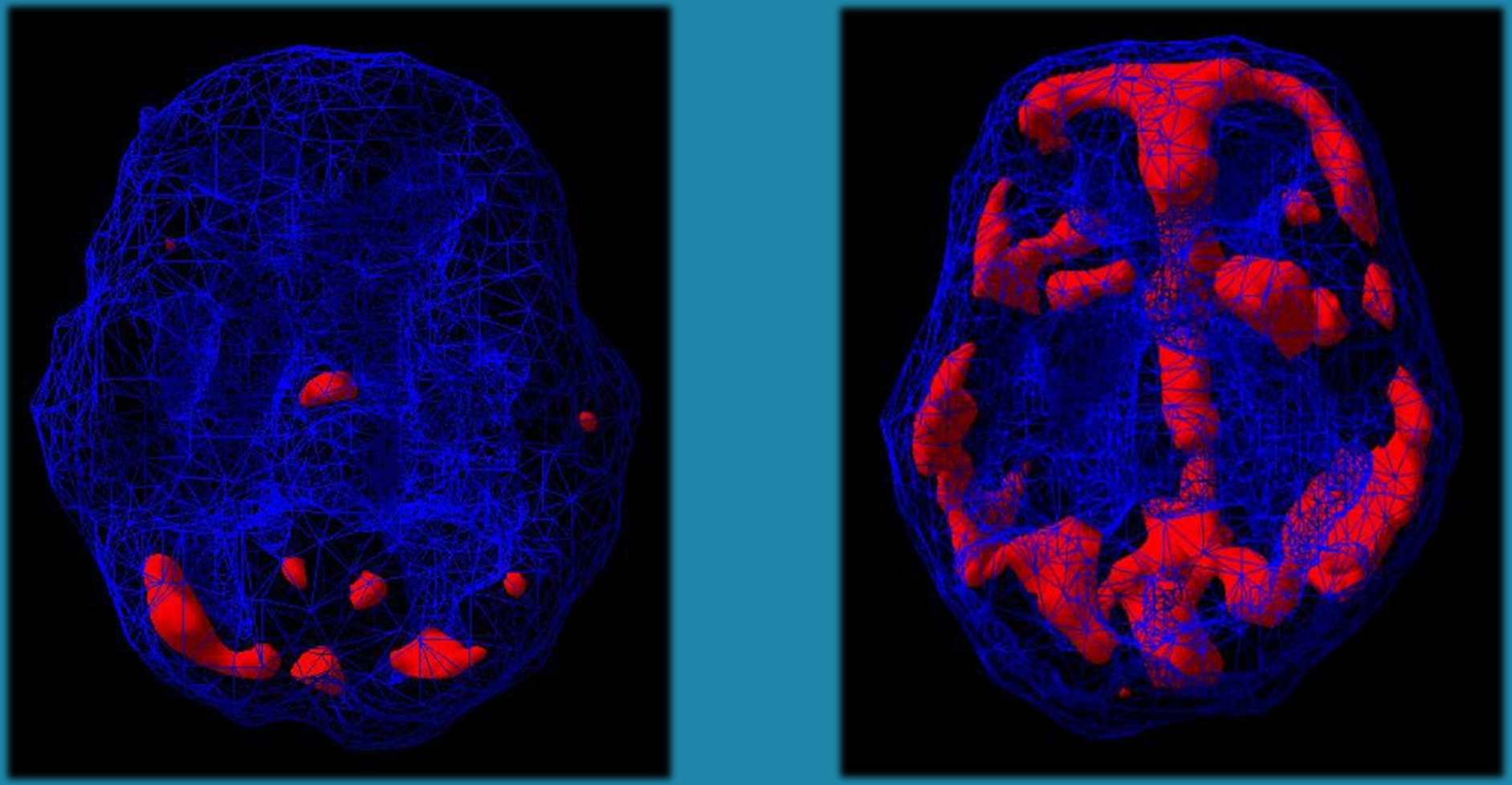
Myth: Scans Change Moment to Moment

- Less than 3% variability over 3 weeks (Mena)
- Need to do something to change the scan
- Time of cycle matters, as it does change during a woman's cycle, if she has PMS
- Age matters – we did a study with 8,000 scans to show brain changes over the lifespan

Early Lesson

- ADHD
- Anxiety
- Depression
- Addictions
- NOT single or simple disorders
- All have multiple types

Two Patients with Depression



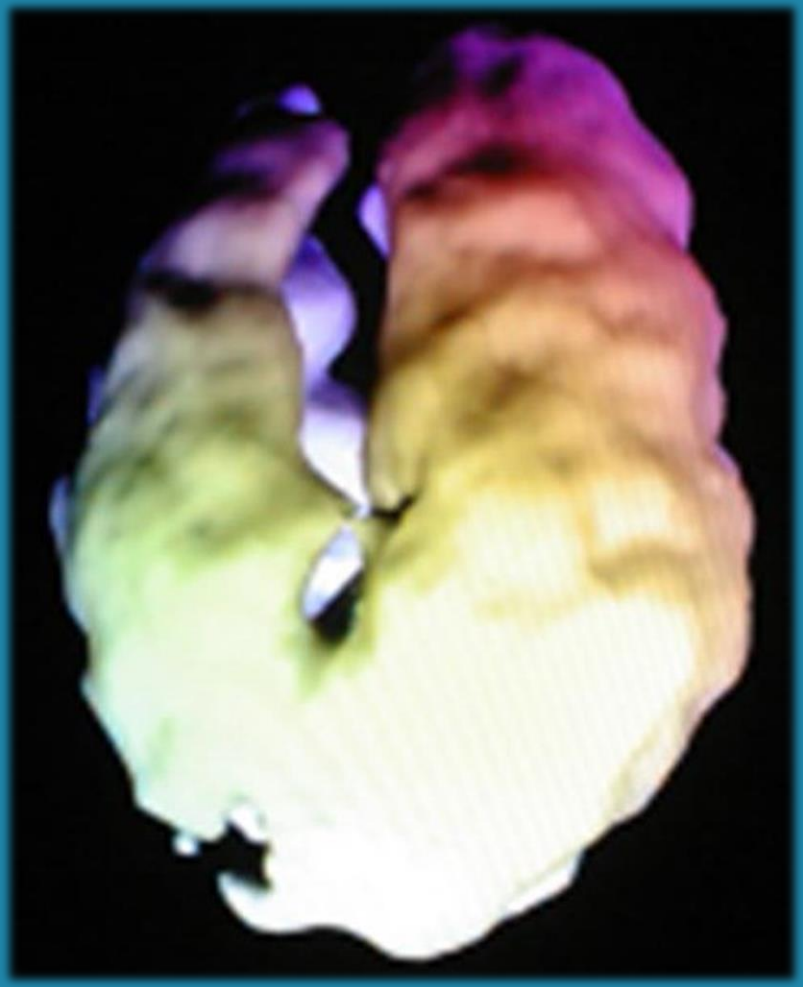
Rx Needs to be Tailored to Individual Brains

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Early Lesson

- **Mild traumatic brain injuries are a major cause of psychiatric illness**

Mild Traumatic Brain Injury



Mild?

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Undiagnosed Brain Injuries Are a Major Cause of:

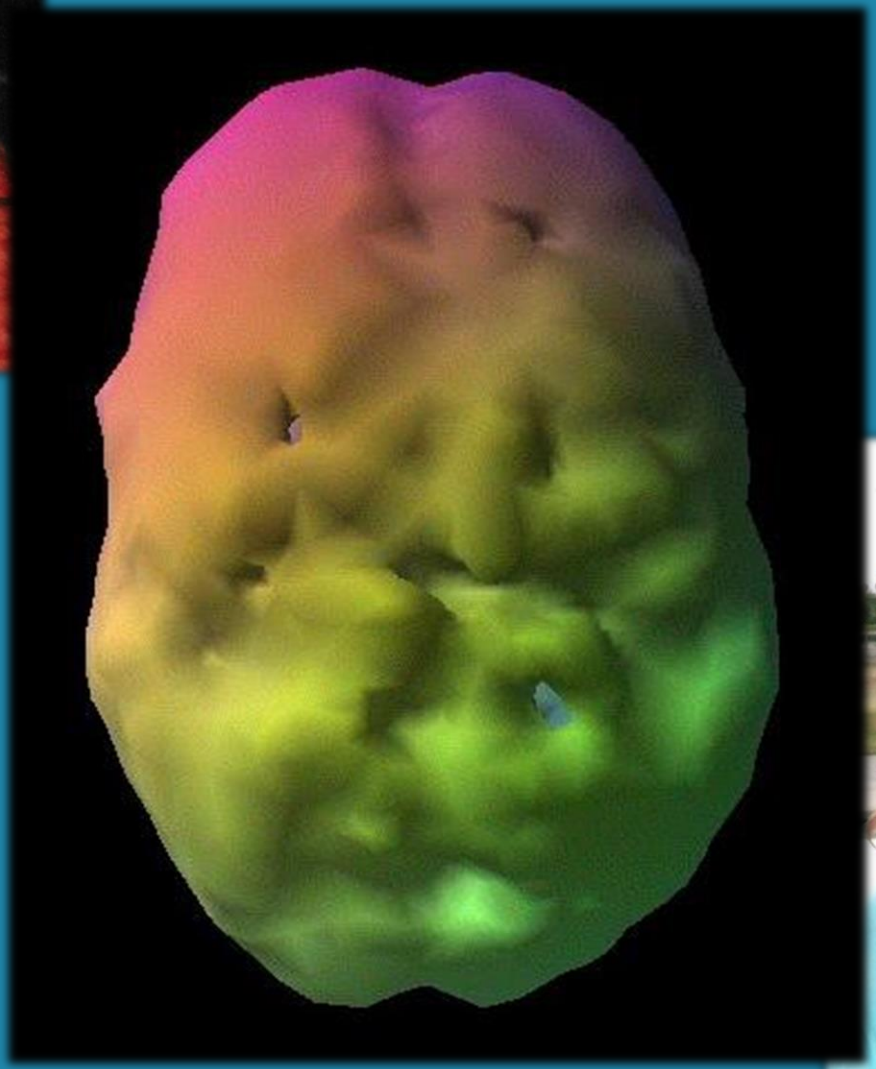
- Homelessness
- Drug/alcohol abuse
- Depression
- Panic attacks
- ADHD
- Suicide

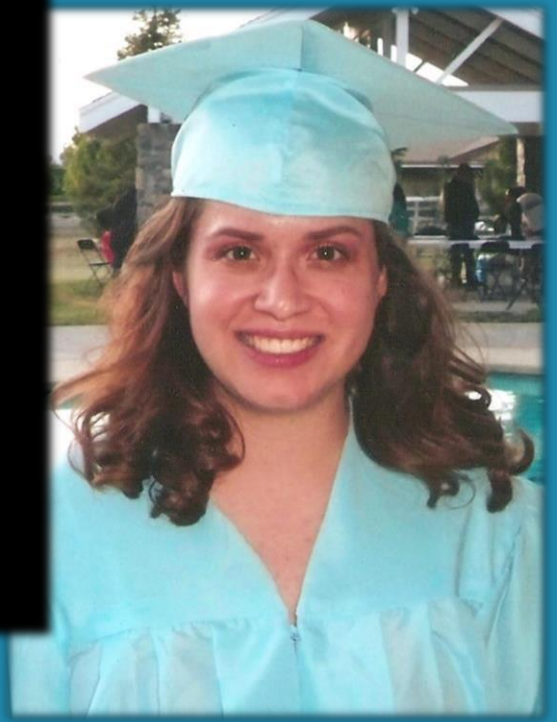
Courtesy Amen Clinics, Inc. www.AmenClinics.com

Early Lesson

- **Infectious disease is a common cause of psychiatric symptoms**

Adrianna





Courtesy Amen Clinics, Inc. www.AmenClinics.com

More Lessons

- Judges and defense attorneys sought our help to understand criminal behavior
- > 500 convicted felons, including 90 murderers
- Our work taught us that people who do bad things often have troubled brains
- Many of these brains could be rehabilitated

Radical Idea?

- What if we evaluated and treated troubled brains,
- rather than simply warehousing them in toxic, stressful environments?
- In my experience, we could save tremendous $$ by making people more functional
- So, when they got out of prison they could work, support their families and pay taxes.

Fyodor Dostoevsky

- "A society should be judged not by how it treats its outstanding citizens, but by how it treats its criminals."
- Instead of just Crime and Punishment
- Crime, Evaluation and Treatment

Could Functional Neuroimaging Have Prevented This Tragedy and Others Like it?

Courtesy Amen Clinics, Inc. www.AmenClinics.com

In 1994 NFL Formed Concussion Committee

- Yet, it has never sponsored a functional brain imaging study players
- … instead studied rats
- In 2009 Goodell said to Congress, "NFL didn't know if playing football caused long term brain damage. *They were still studying the issue."*
- NFL acted like many employers – delay … deny and blame the employee when they're hurt

Problem with the NFL Position

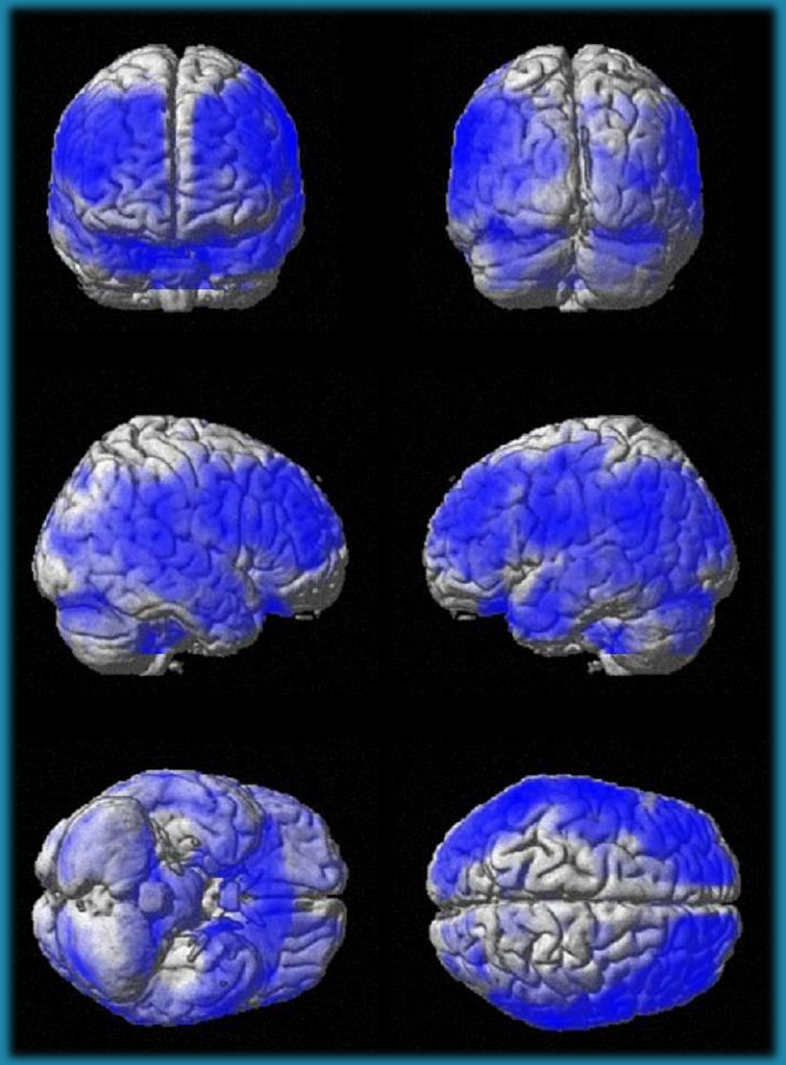
- If you don't admit you have a problem, you cannot do anything to solve it!
- Many brain damaged NFL players were left without help or hope
- 2009-2011 Amen Clinics with LA Chapter of NFLPA performed first large functional imaging study on players
- Brain SPECT imaging helped to change everything

Active and Retired NFL Players Damage Seen Across Whole Brain

CLINICAL AND RESEARCH RE

Impact of Playing American Professional Football on Long-Term Brain Function

Daniel G. Amen, M.D.
Andrew Newberg, M.D.
Robert Thatcher, Ph.D.
Yi Jin, M.D.



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Damage Seen Across Whole Brain

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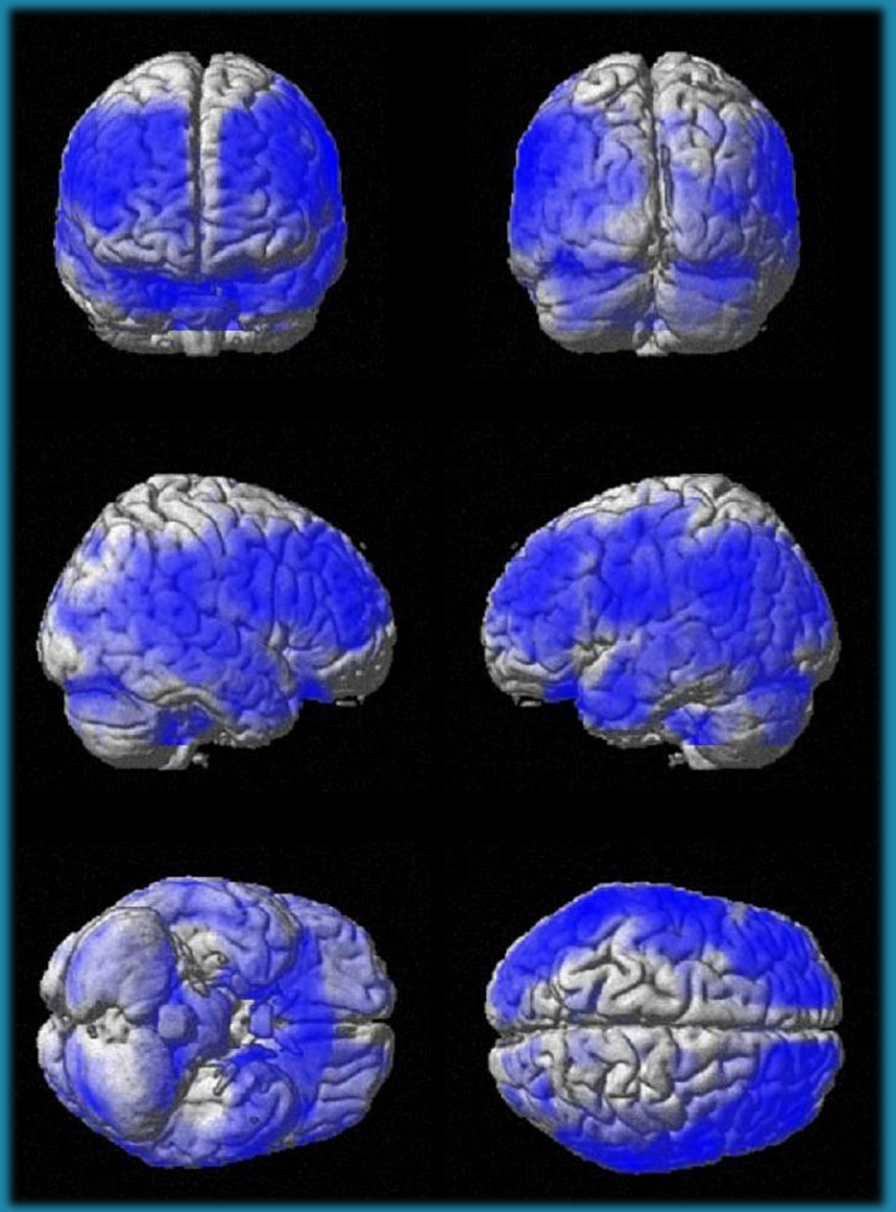
David Keator, M.C.S.
Kristen Willeumier, Ph.D.

The authors recruited 100 active and former National Football League players, representing 27 teams and all positions. Players underwent a clinical history, brain SPECT imaging, qEEG,



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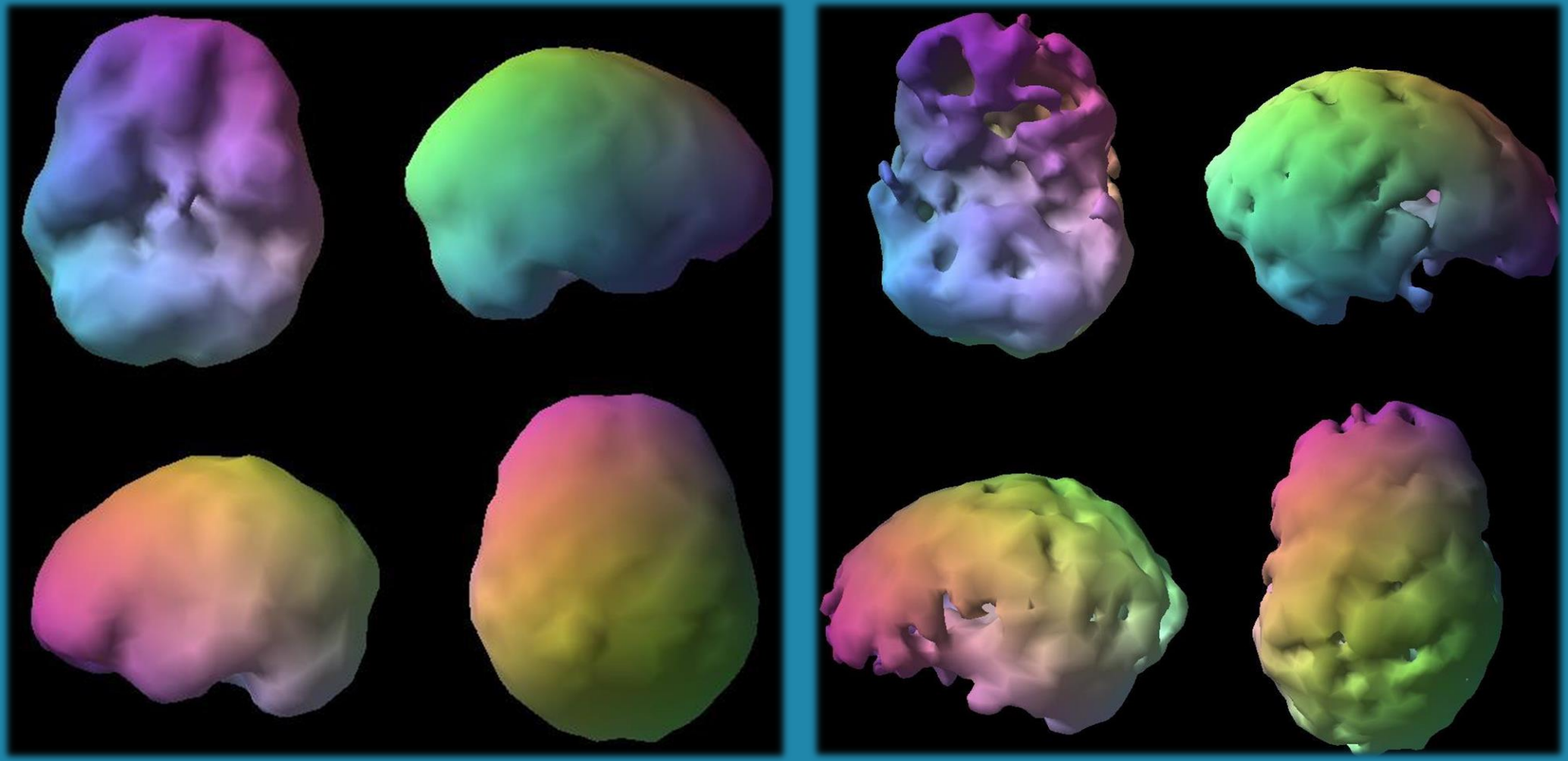


Healthy **16 Year Guard**

Courtesy Amen Clinics, Inc. www.AmenClinics.com

2011 … NFL Radically Changed Its Position On TBI

None of this was possible without the clinical application of neuroimaging.

Courtesy Amen Clinics, Inc. www.AmenClinics.com

CONCUSSION

A Must Read for NFL Players

Let's Take Brain Injuries Out of Play

Concussion Facts

Concussion is a *brain injury* that alters the way your brain functions

Concussion can occur from a blow to the head/body:

- following helmet to helmet contact, and / or
- contact with the ground, object or another player

Most concussions occur without being knocked unconscious

Severity of injury depends on many factors and is not known until symptoms resolve and brain function is back to normal

All concussions are not created equally. Each player is different, each injury is different and all injuries should be evaluated by your team medical staff

Concussion Symptoms

Different symptoms can occur and may not show up for several hours. Common symptoms include:

- Confusion
- Headache
- Amnesia / Difficulty remembering
- Balance problems
- Irritability
- Dizziness
- Difficulty concentrating
- Nausea
- Feeling sluggish, foggy or groggy
- Sensitivity to noise
- Sensitivity to light
- Double / fuzzy vision
- Slowed reaction time
- Feeling more emotional
- Sleep disturbances
- Loss of consciousness

Symptoms may worsen with physical or mental exertion (e.g. lifting, computer use, reading)

Why Should I Report My Symptoms?

- Practicing or playing while still experiencing symptoms can prolong the time to recover and return to play.
- Unlike other injuries, there may be significant consequences of "playing through" a concussion. Repetitive brain injury, when not treated promptly and properly may cause permanent damage to your brain.

What Should I Do If I Think I've Had a Concussion?

Report it. Never ignore symptoms even if they appear mild. Look out for your teammates. Tell your Athletic Trainer or Team Physician if you think you or a teammate may have had a concussion.

Get Checked Out. Your team medical staff has your health and well being as its first priority. They will manage your concussions according to NFL / NFLPA Guidelines which include being fully asymptomatic, both at rest and after exertion, having a normal neurologic examination, normal neuropsychological testing, and clearance to play by both the team medical staff and the independent neurologic consultant.

Take Care of Your Brain. According to the CDC*, "traumatic brain injury can cause a wide range of short– or long term changes affecting thinking, sensation, language , or emotions". These changes may lead to problems with memory and communication , personality changes, as well as depression and the early onset of dementia. Concussions and conditions resulting from repeated brain injury can change your life and your family's life forever.

Work smart. Use your head, don't lead with it. Help make our game safer. Other athletes are watching...

Brain Rehab Program

- Damage so high, we performed a "real-world" rehabilitation study
- Brain healthy strategies (diet, exercise, weight loss, if needed)
- Brain boosting supplements (5.6 grams fish oil, B6, B12, folic acid, gingko, vinpocetine, huperzine A, NAC, carnitine, and alpha lipoic acid)

Significant Rehabilitation Possible

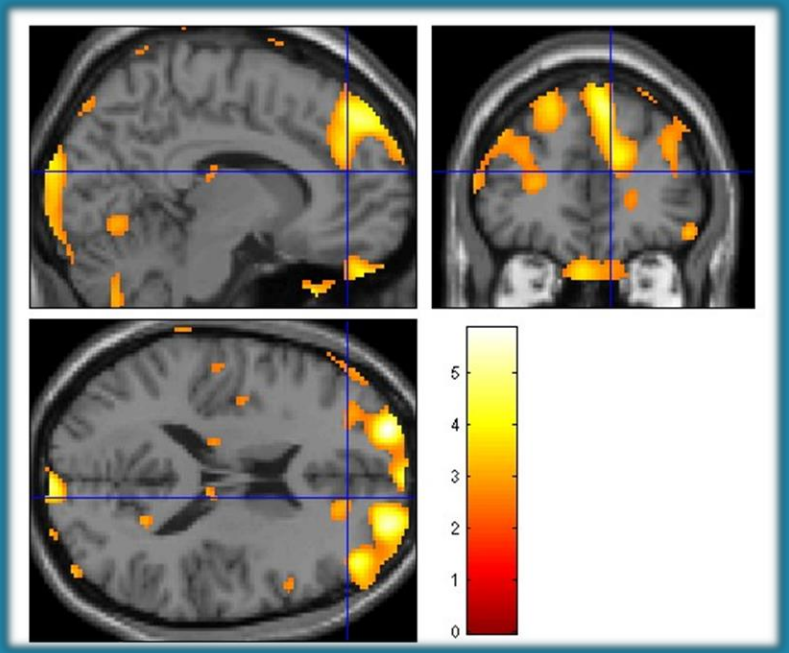
Journal of Psychoactive Drugs, 43 (1), (insert page range of article here), 2011

ISSN: 0279-1072 / 2159-9777 online
DOI: 10.1080/02791072.2011.566489

Routledge
Taylor & Francis Group

Reversing Brain Damage in Former NFL Players: Implications for Traumatic Brain Injury and Substance Abuse Rehabilitation†

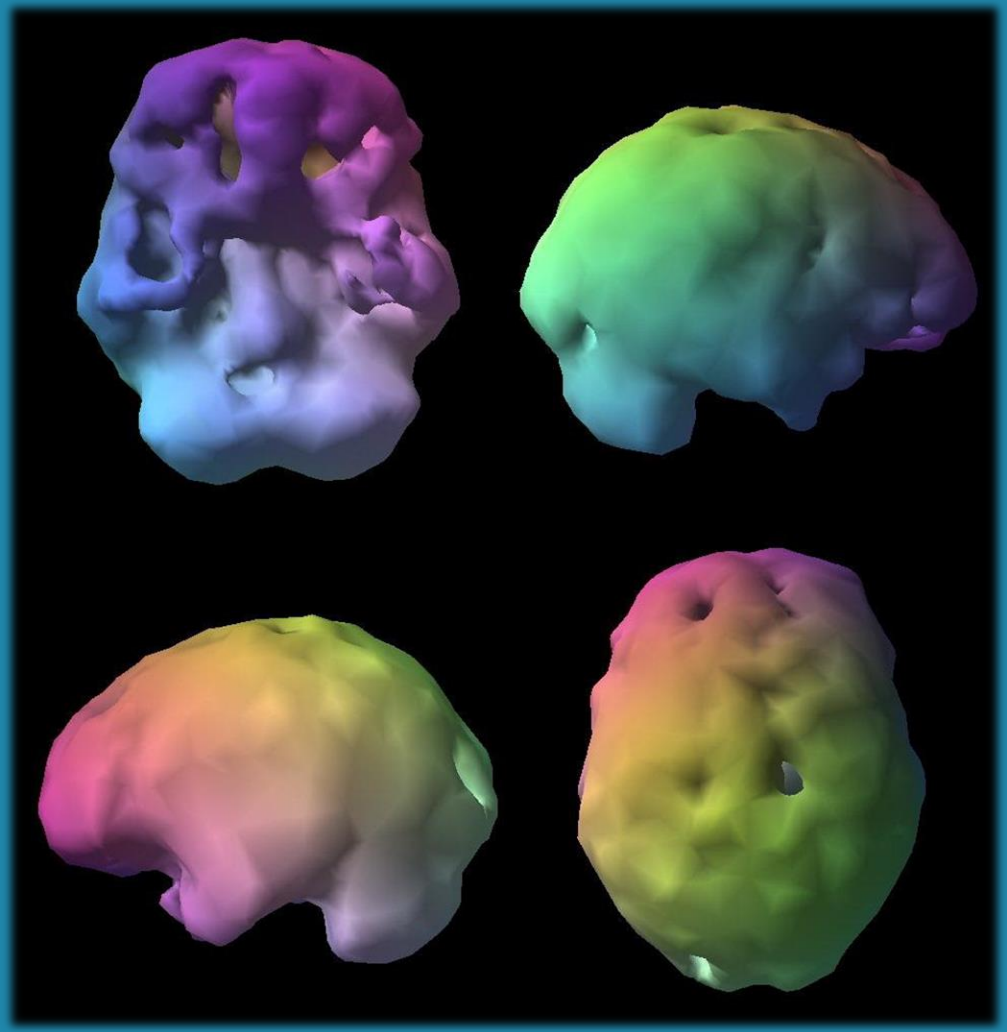
Daniel G. Amen, M.D.*; Joseph C. Wu, M.D.**; Derek Taylor*** & Kristen Willeumier, Ph.D.****

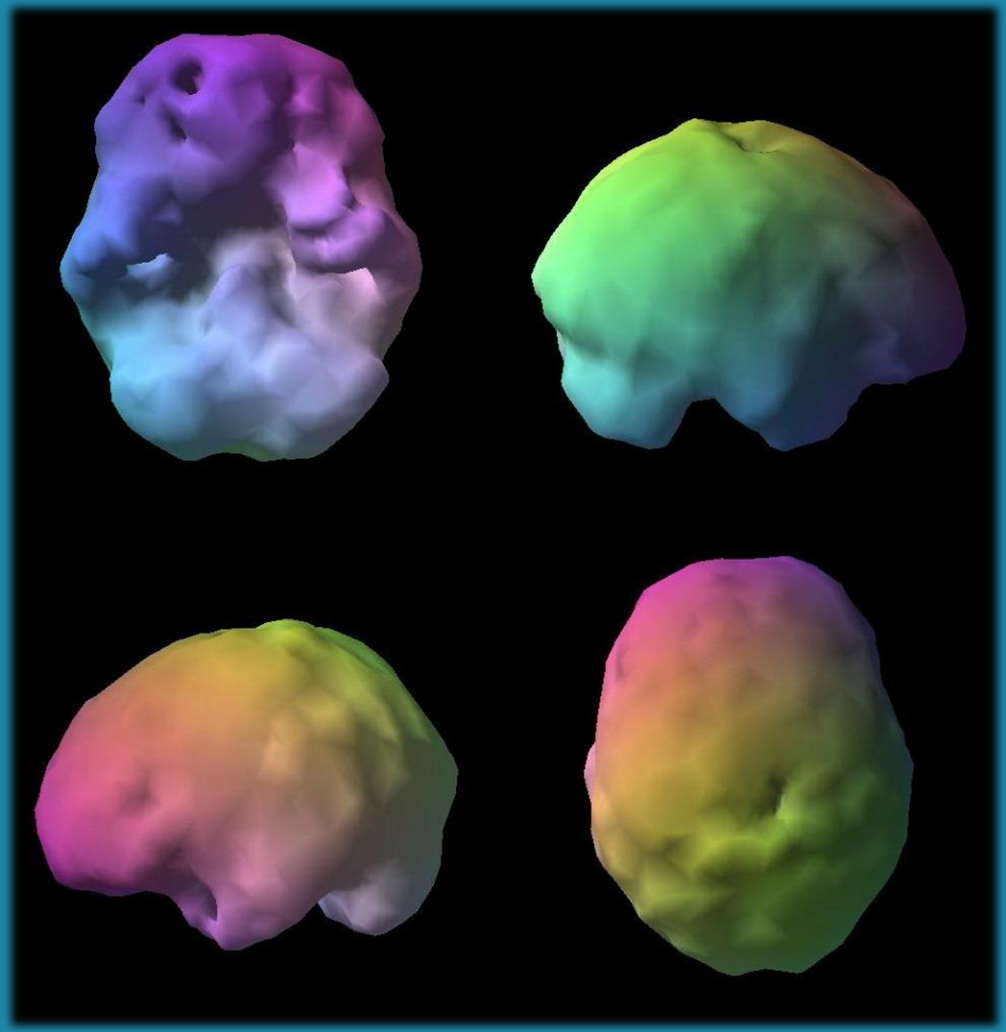


- 65 players
- 80% improvement
- Especially in:
  - Memory 69%
  - Attention 53%
  - Mood 40%
  - Motivation 40%
  - Sleep 25%

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Tight End 12 Years

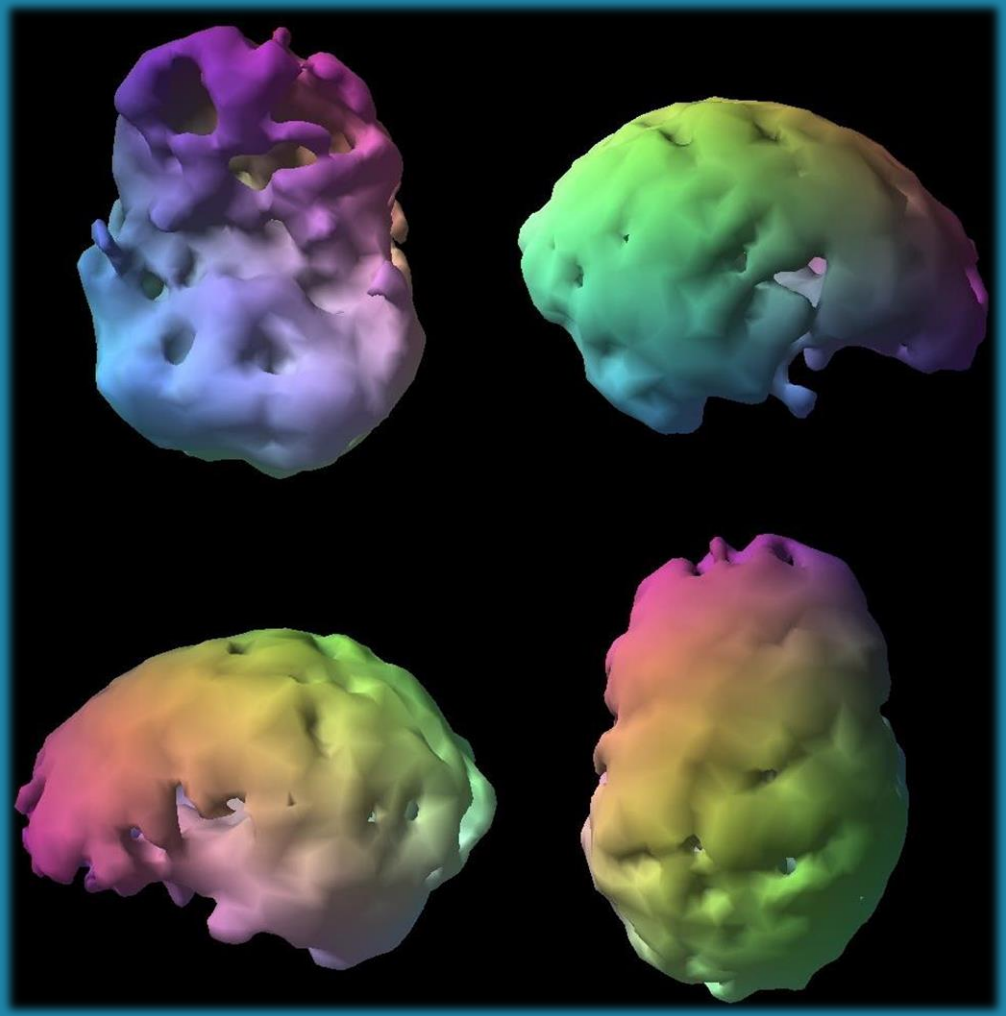




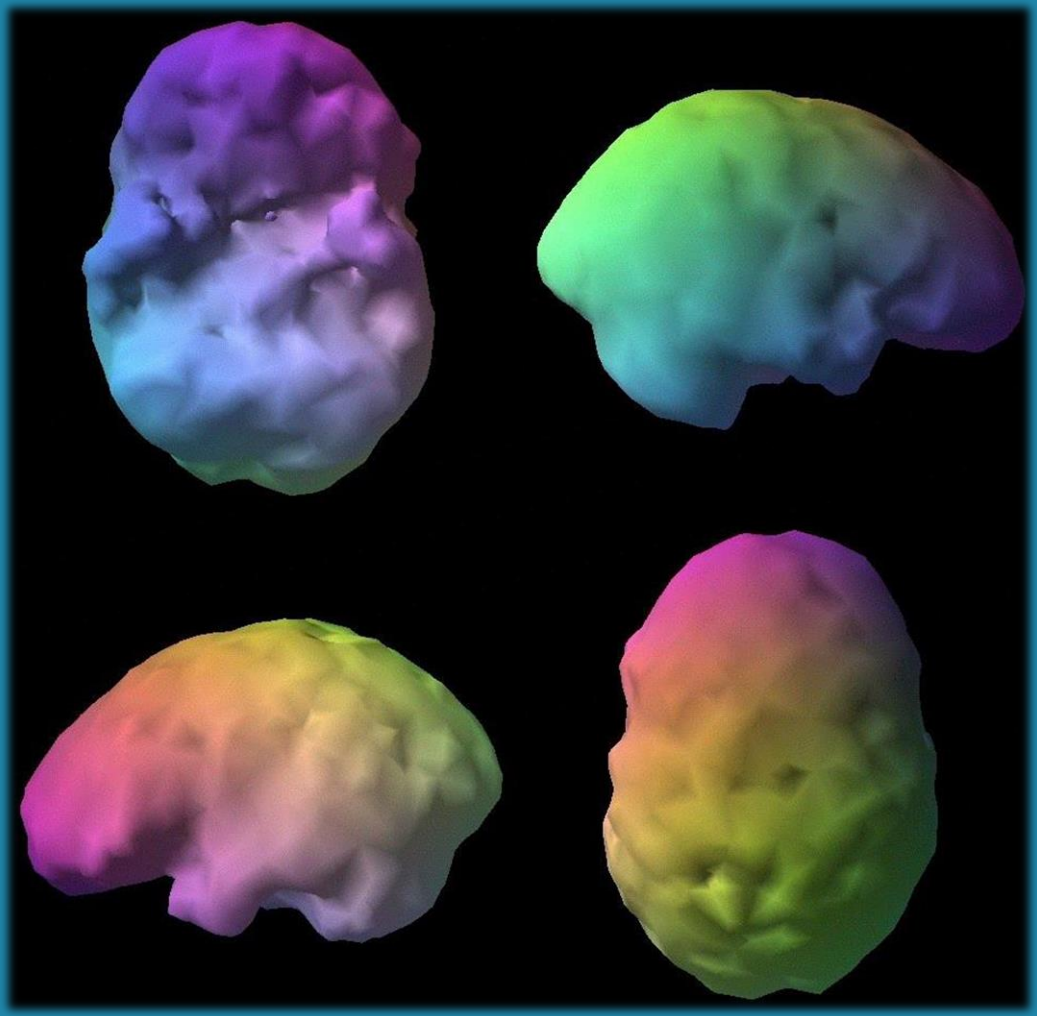
Before **After 18 mos**

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Guard 16 Years



Before

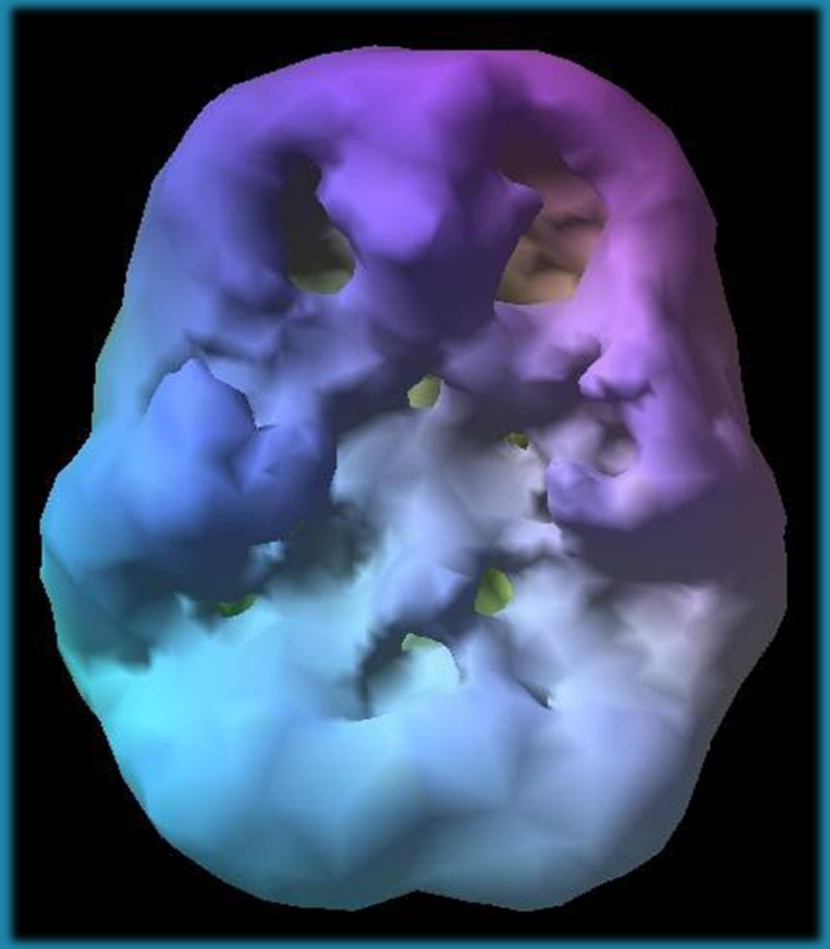


After 18 mos

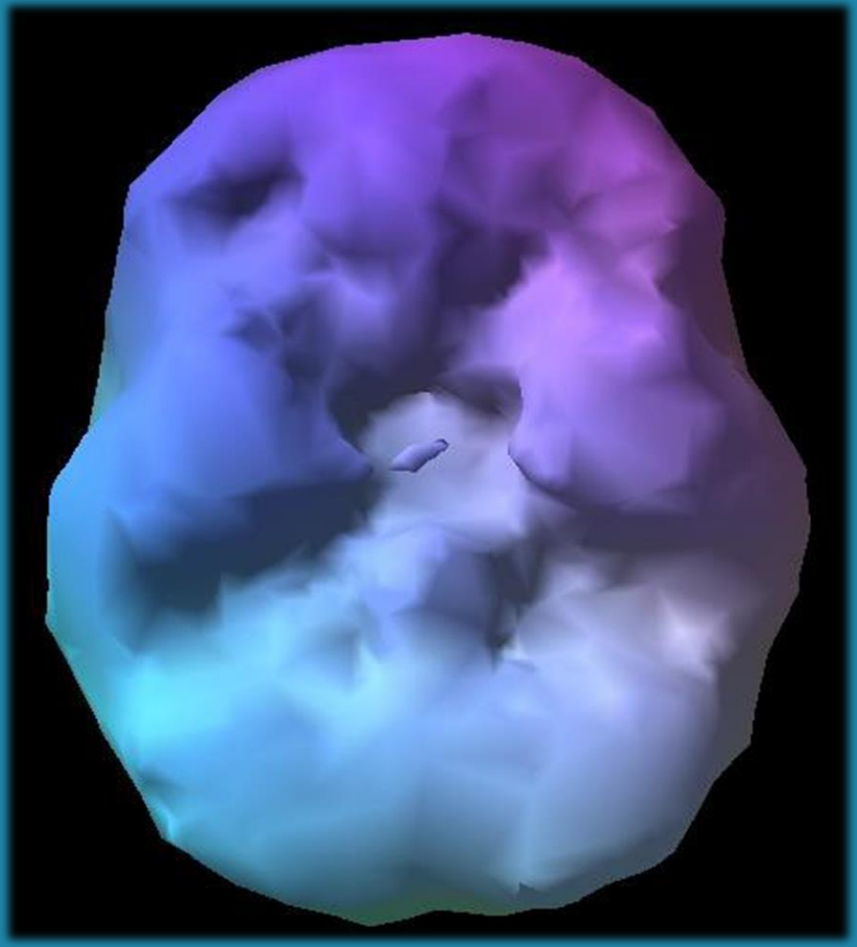
Courtesy Amen Clinics, Inc. www.AmenClinics.com

Reversing Brain Damage is an Exciting New Frontier, But the Implications Are Wider

From Failure to Success



Before

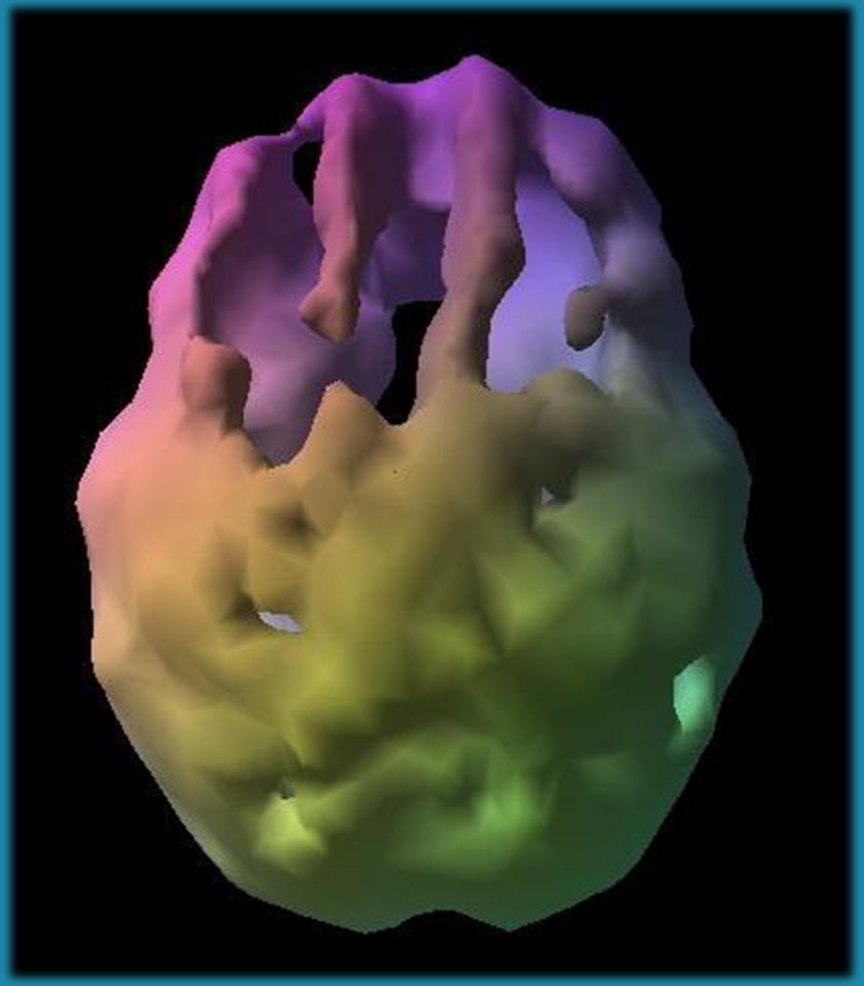


After

Courtesy Amen Clinics, Inc. www.AmenClinics.com

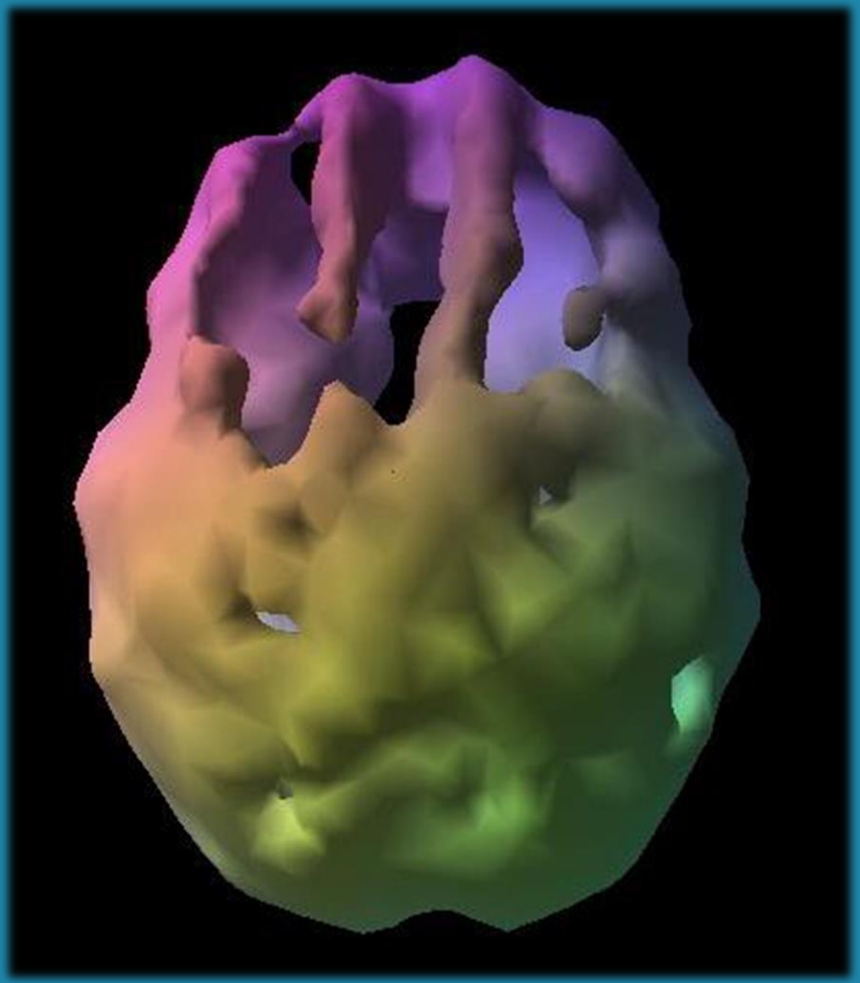
Ray and Nancy

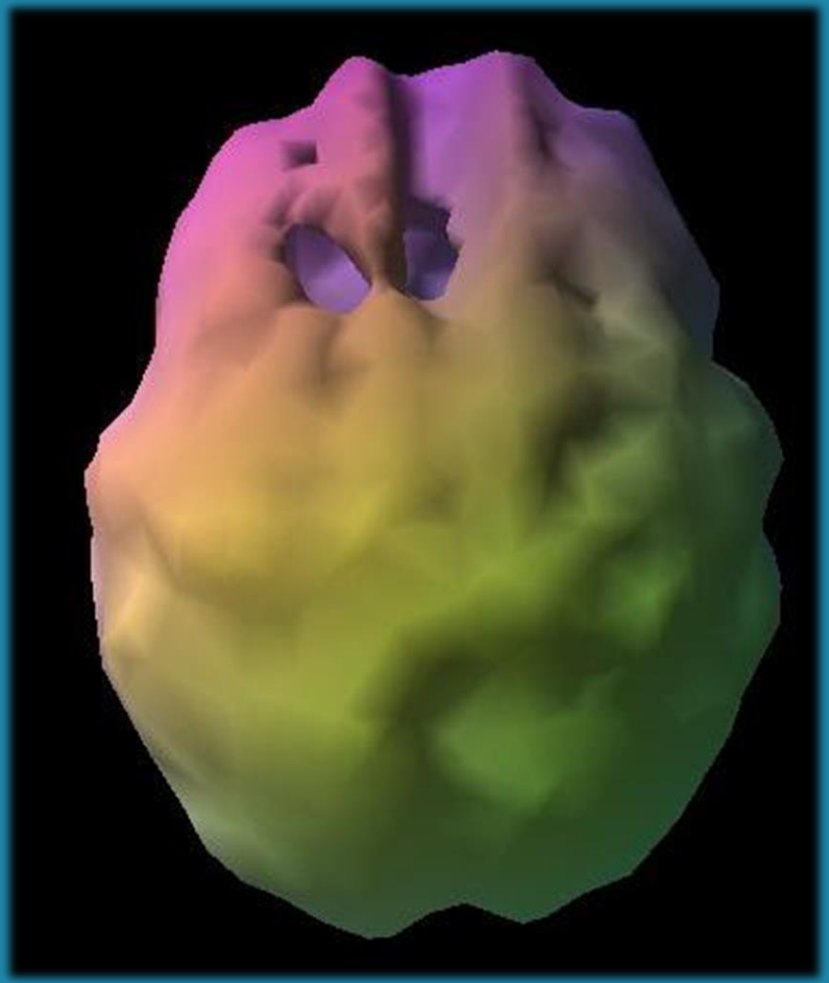
Courtesy Amen Clinics, Inc. www.AmenClinics.com



Nancy

Courtesy Amen Clinics, Inc. www.AmenClinics.com





Before

After 10 Weeks

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Ray and Nancy After

Courtesy Amen Clinics, Inc. www.AmenClinics.com

Andrew

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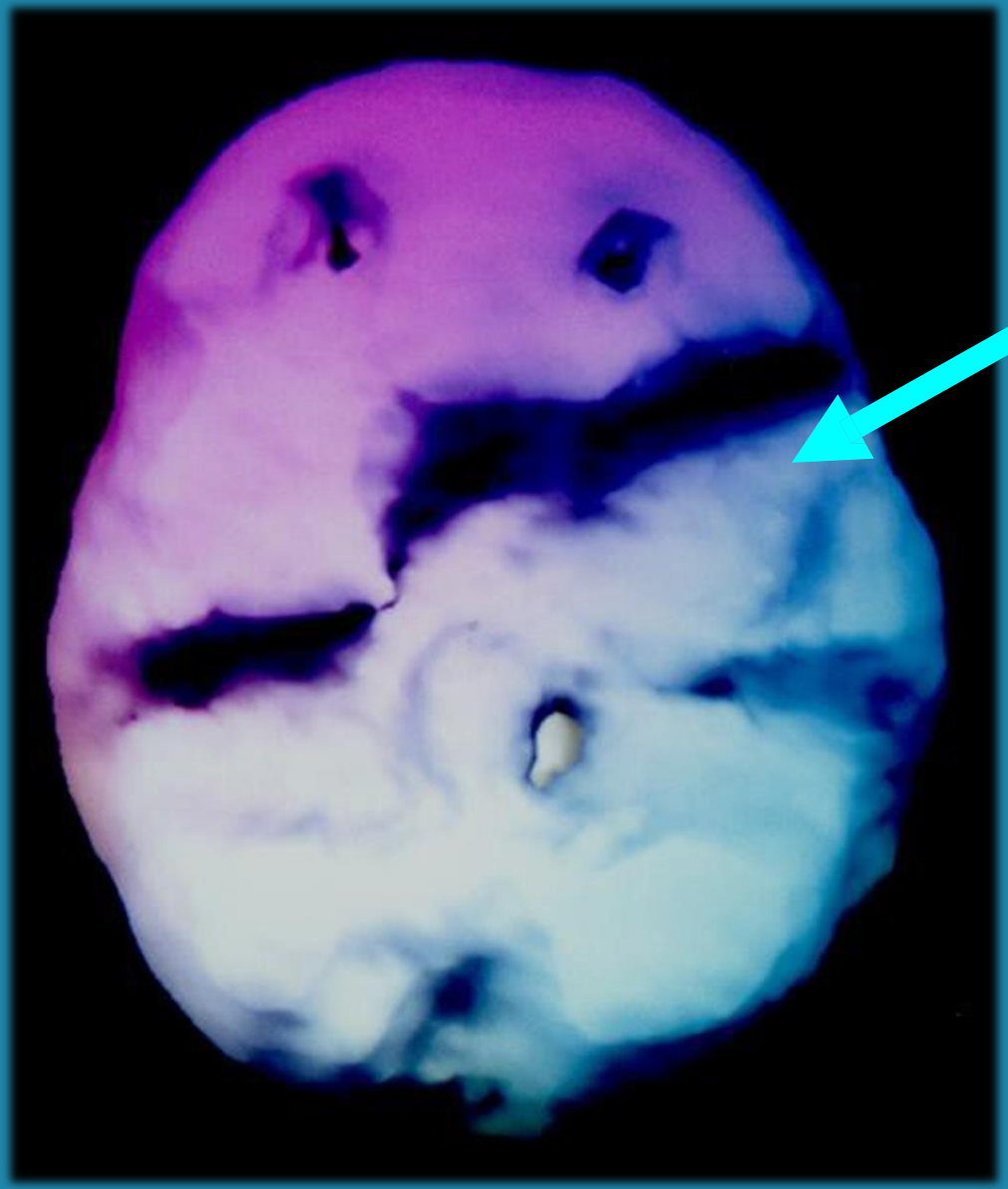

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Psychiatry is in Trouble

- If you don't admit you have a problem you cannot do anything to change it
- Outcomes not better in decades depression, schizophrenia, bipolar disorder, and ADHD despite decades of research and billions of dollars (Insel 2009)
- Nomenclature is misleading

By Not Using Functional Imaging Routinely in Clinical Practice

- We hurt patients and their families
- We hurt our society
- We diminish our profession
- Patients are mislabeled and mistreated
- Within 10 years it'll be malpractice not to use functional imaging in complex cases

Different Types of Scans Available Today

- SPECT - single photon emission computed tomography
- PET – positron emission tomography
- fMRI – functional MRI
- qEEG – quantitative EEG
- MEG

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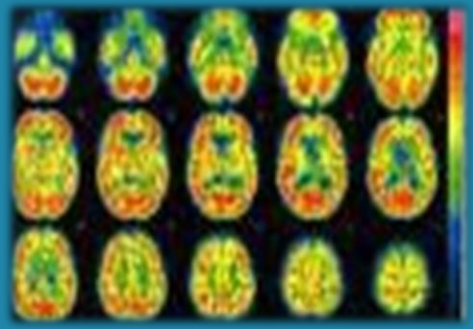
SPECT

- Uses a radioisotope, typically Tc99, combined to a pharmaceutical, either HMPAO or ECD, to measure regional cerebral blood flow
- May also measure receptor activity
- Long exposure
- Image happens in injection room
- Up to 6 hours after injection to scan



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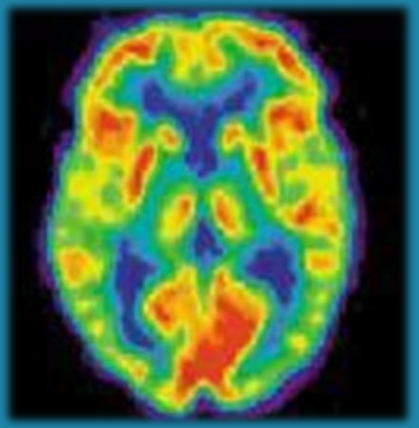
PET



- Positron emission tomography
- Uses radioisotopes to measure glucose metabolism, rCBF, or receptor activity
- In academic settings improved resolution
- Short exposure

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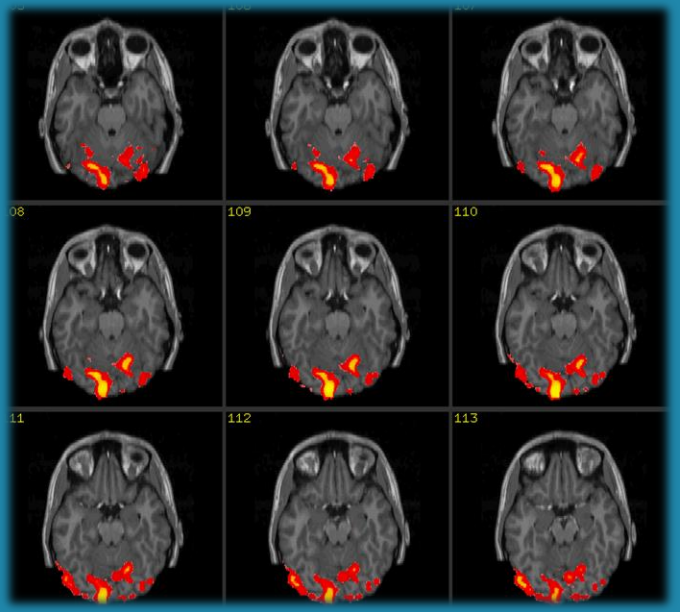
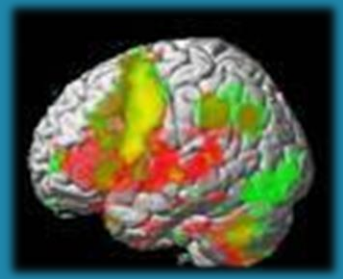
fMRI



- Functional magnetic resonance imaging
- Measures blood flow changes
- Very short exposure
- What is really being measured - anxiety?
- Do magnets change the brain all by themselves?
- No radiation
- Can repeat scans as often as desired



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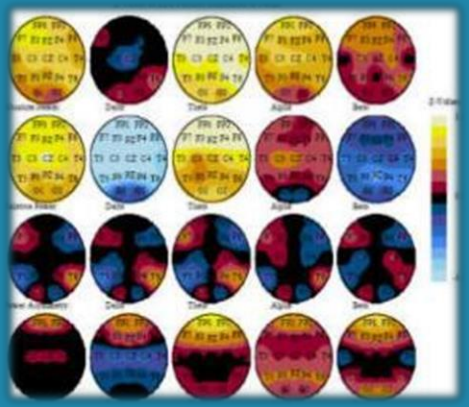

qEEG

- Quantitative electroencephalography
- Uses electrodes placed on the scalp to measure brain wave activity
- Immediate exposure
- Scalp placements limit information from deep brain structures

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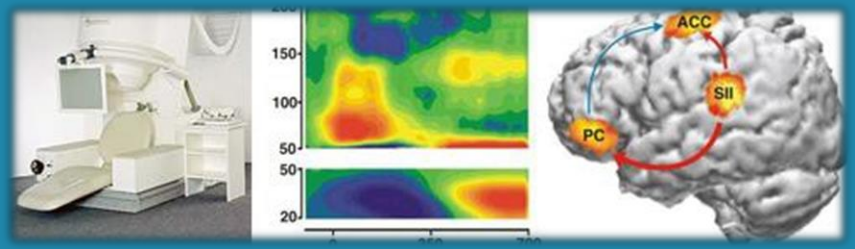

MEG

- Magneto-encephalography
- Uses electrodes placed on the scalp to measure brain wave activity
- Immediate exposure
- Scalp placements limit information from deep brain structures?

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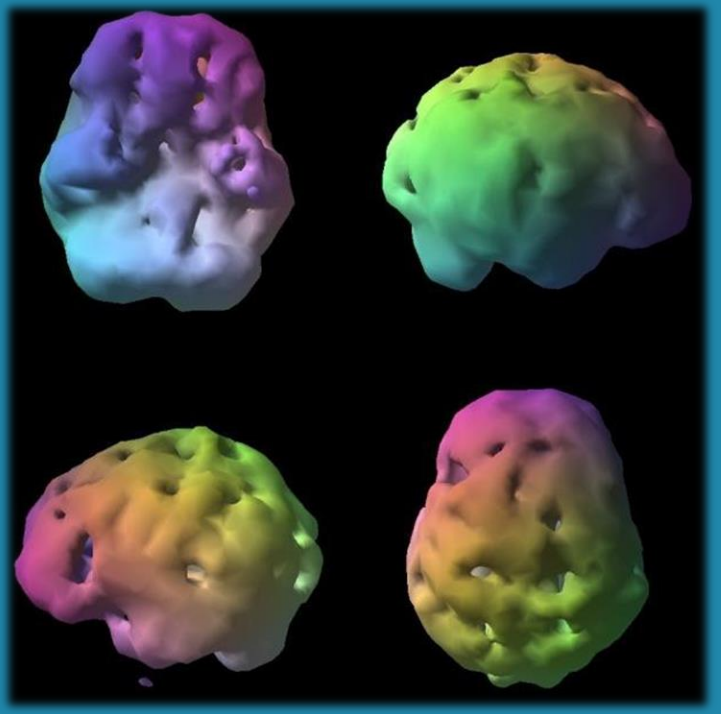
How SPECT Changes Psychiatric Diagnosis and Treatment

- **What can SPECT tell clinicians and patients that they can not obtained through:**
  - **History**
  - **Mental status examinations**
  - **Physical examinations or**
  - **Neuropsychological testing**



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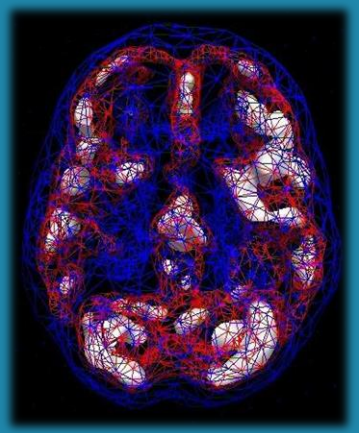
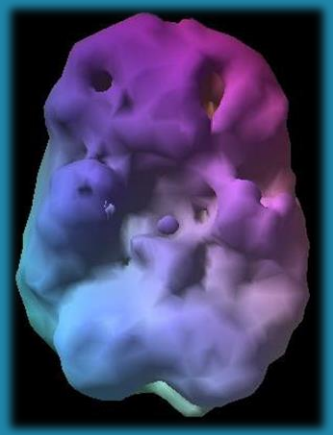
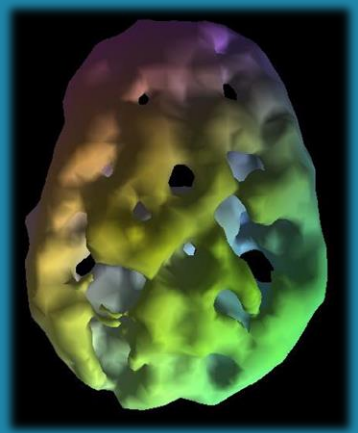
Better Questions

- Harold Bursztajn, MD, Harvard says, "SPECT doesn't give you the answer, it teaches you to ask better questions."
- It helps to understand underlying physiology
- Is brain overactive, underactive, injured or toxic?

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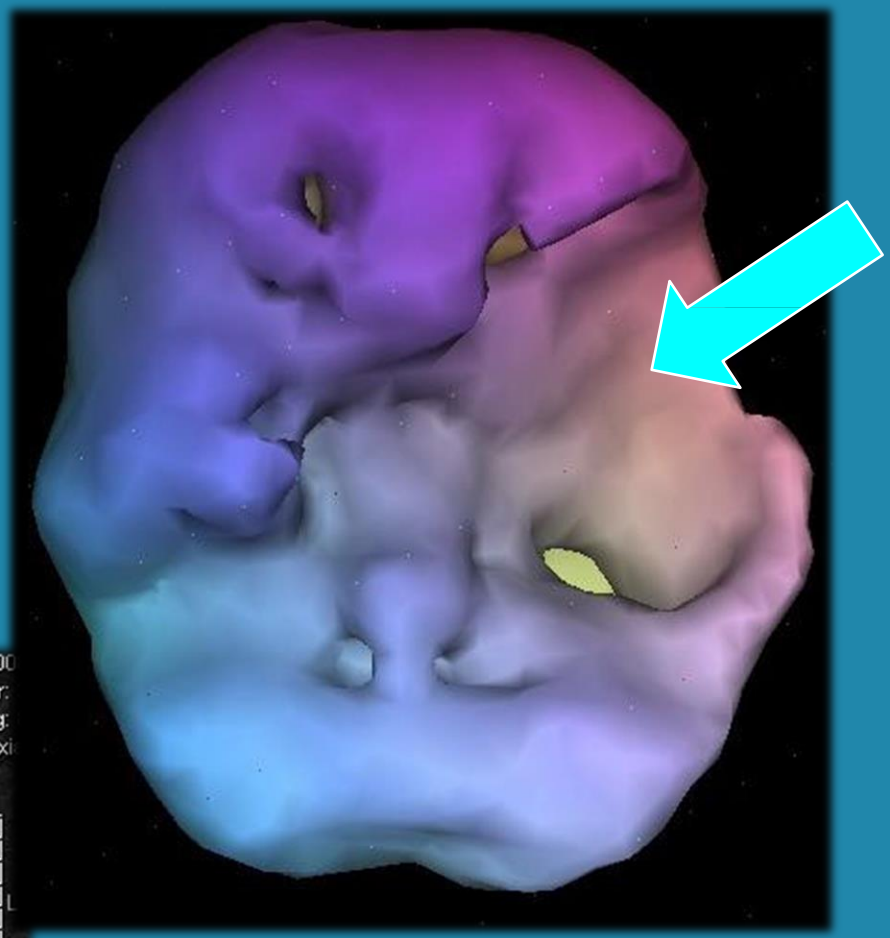
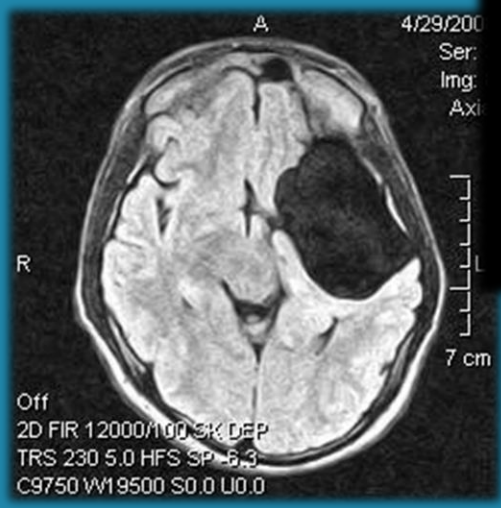
SPECT Helps Prevent Mistakes

- **Such as stimulating an overactive brain or calming one that is underactive**
- **Or missing toxicity or space occupying lesion**





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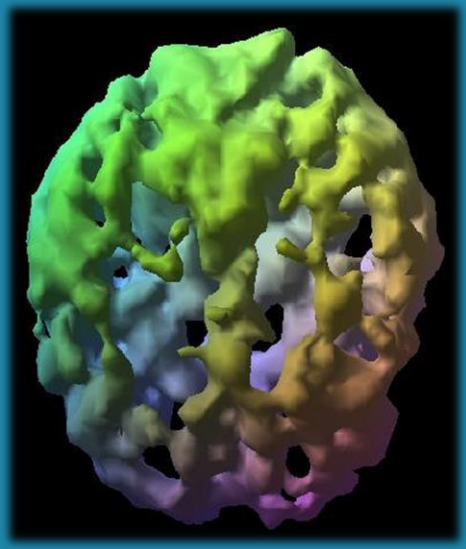
Aid in the Diagnosis and Treatment of Substance Abusers

- Break denial
- Increase compliance – "brain envy"
- Help understand comorbidity
- Follow treatment
- Education and prevention



Amen, DG: High Resolution Brain SPECT Imaging in a Clinical Substance Abuse Practice, 2010 J Psychoactive Drugs. Volume 42(2), June 2010

SPECT Decreases Stigma, Increases Compliance

- Patients and family see problems as medical not moral
- Dramatically decrease shame, guilt, self-loathing and anger
- Increase forgiveness and compassion
- Increase compliance
- We have nothing else in psychiatry that is this powerful or immediate

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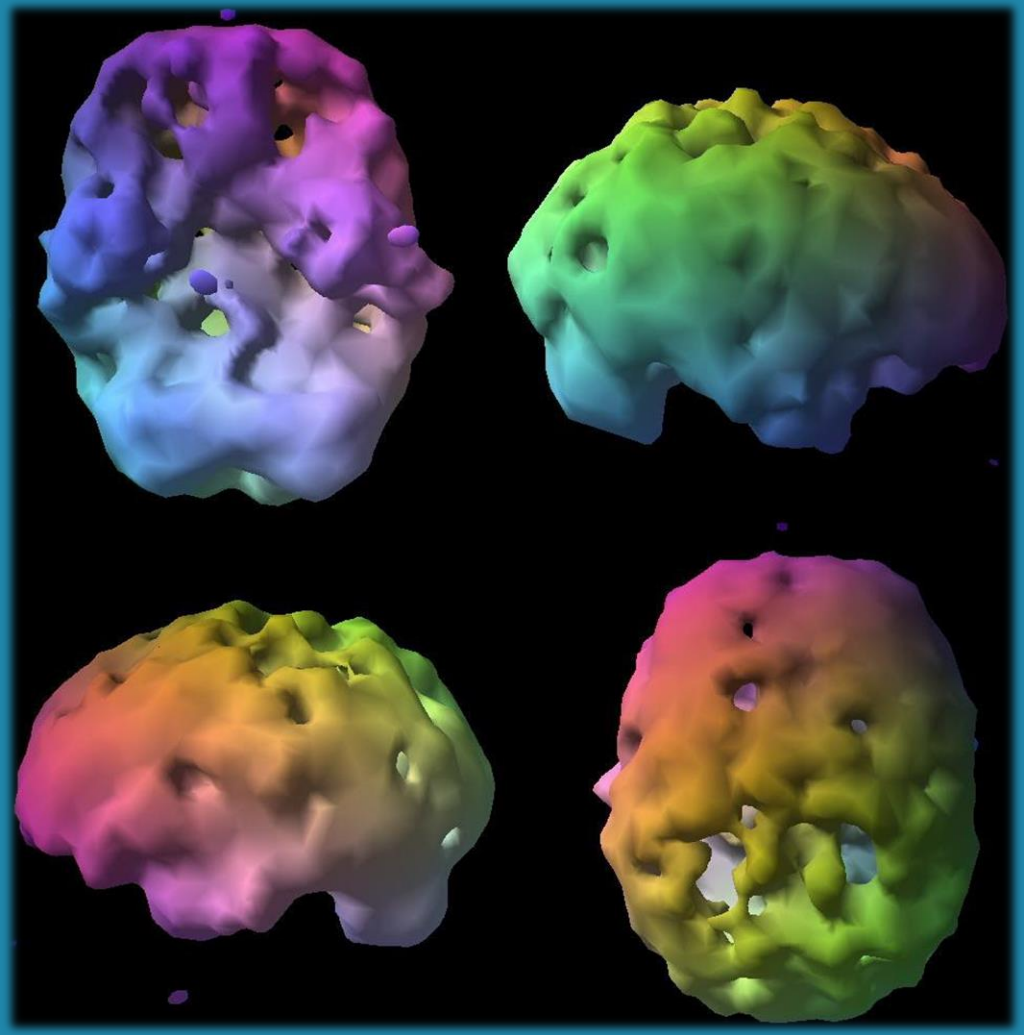
Common SPECT Patterns that Inform Decision Making in Psychiatry

Scalloping/Overall Decreased Perfusion

- Toxicity (drugs or alcohol)
- Chemotherapy
- Environmental toxin
- CO poisoning
- Anoxia
- Infection
- Hypothyroidism
- Severe anemia



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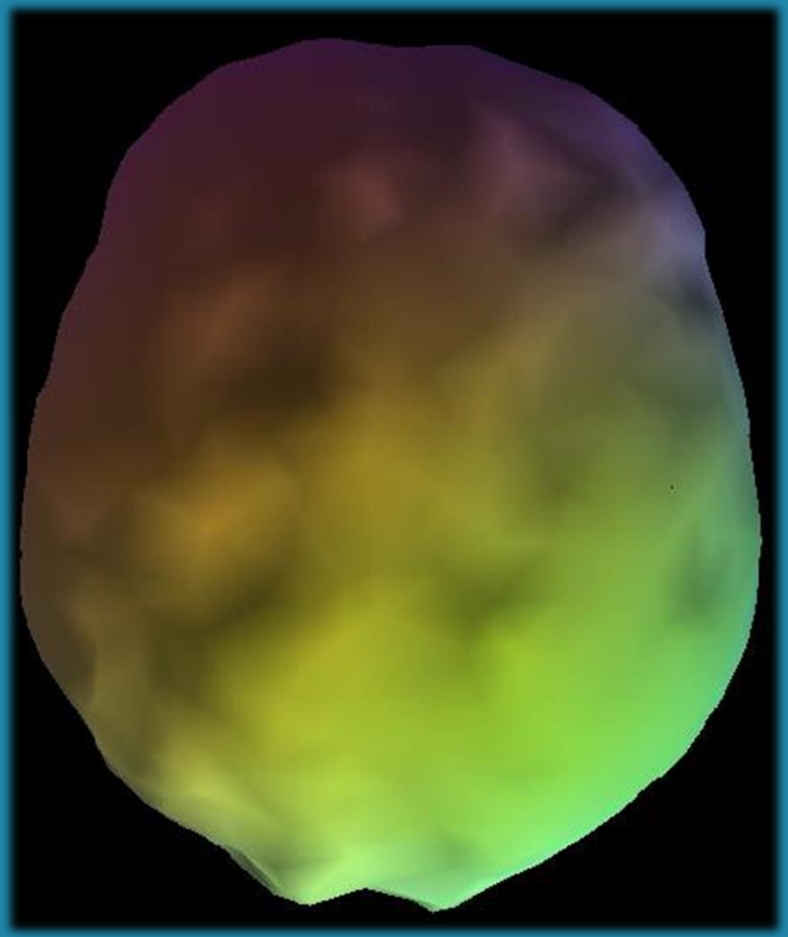
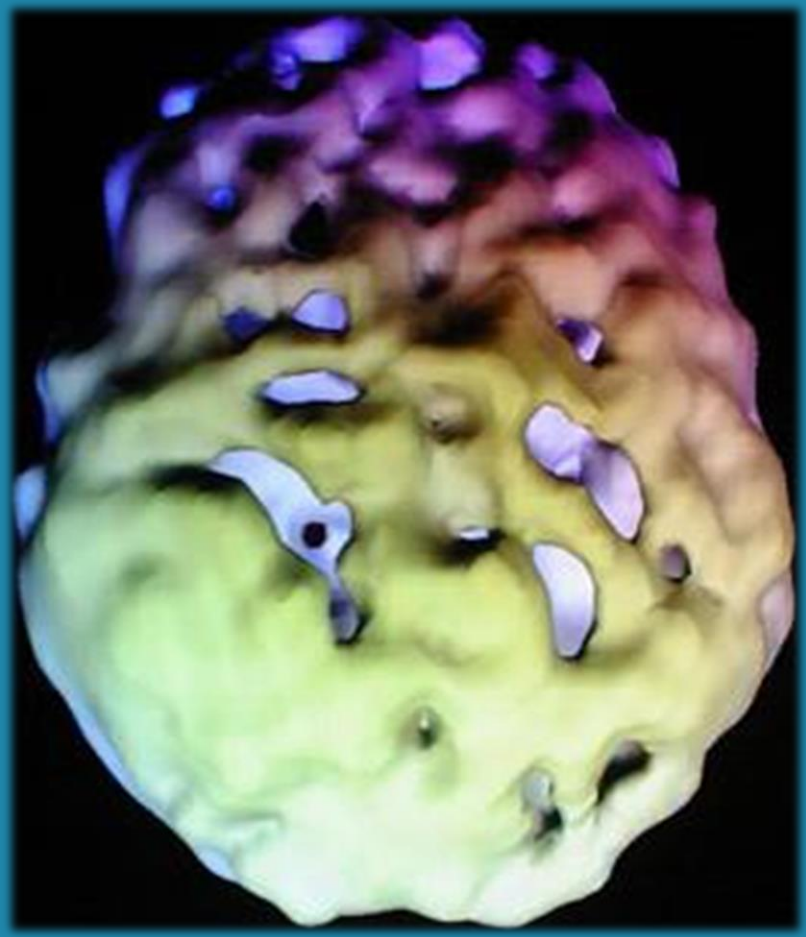
A New Paradigm





Healthy

Got an F in marital Rx

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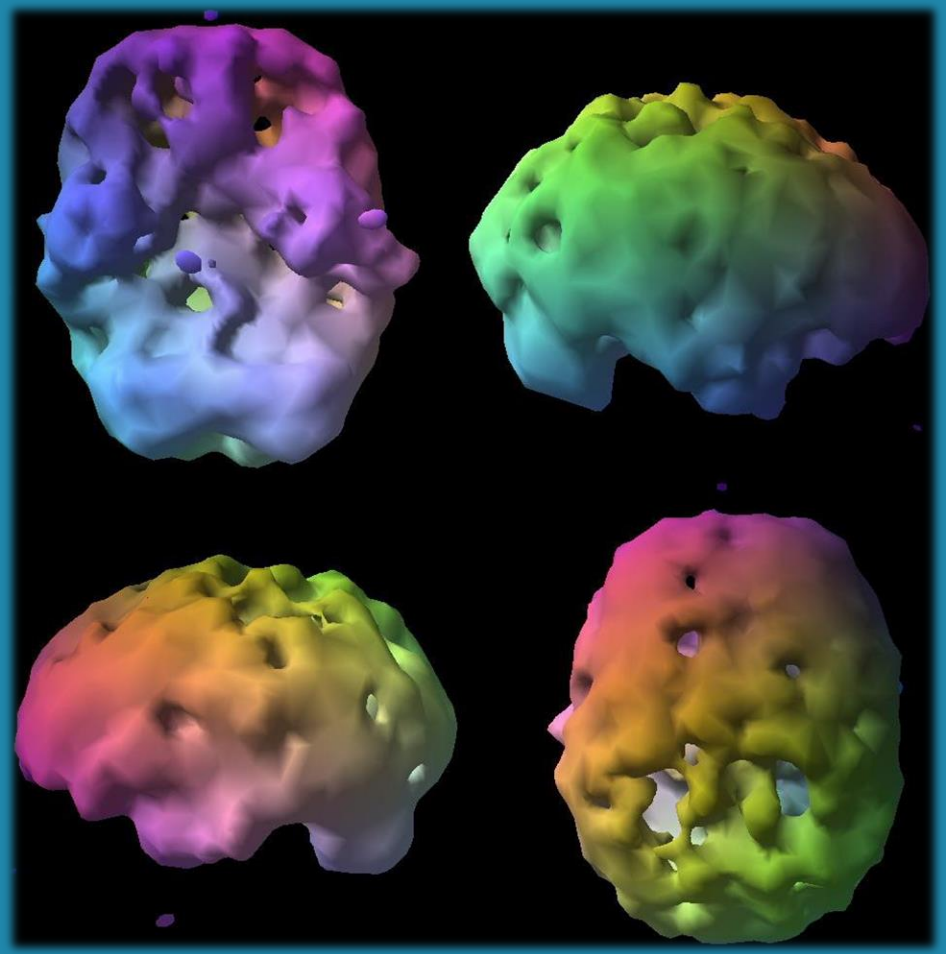
Scalloping Interventions

- Stop the toxin!
- Treat infections
- Brain rehab program
  - Avoid Bad
  - Do Good
  - Neurofeedback
  - HBOT
  - Meds or supplements



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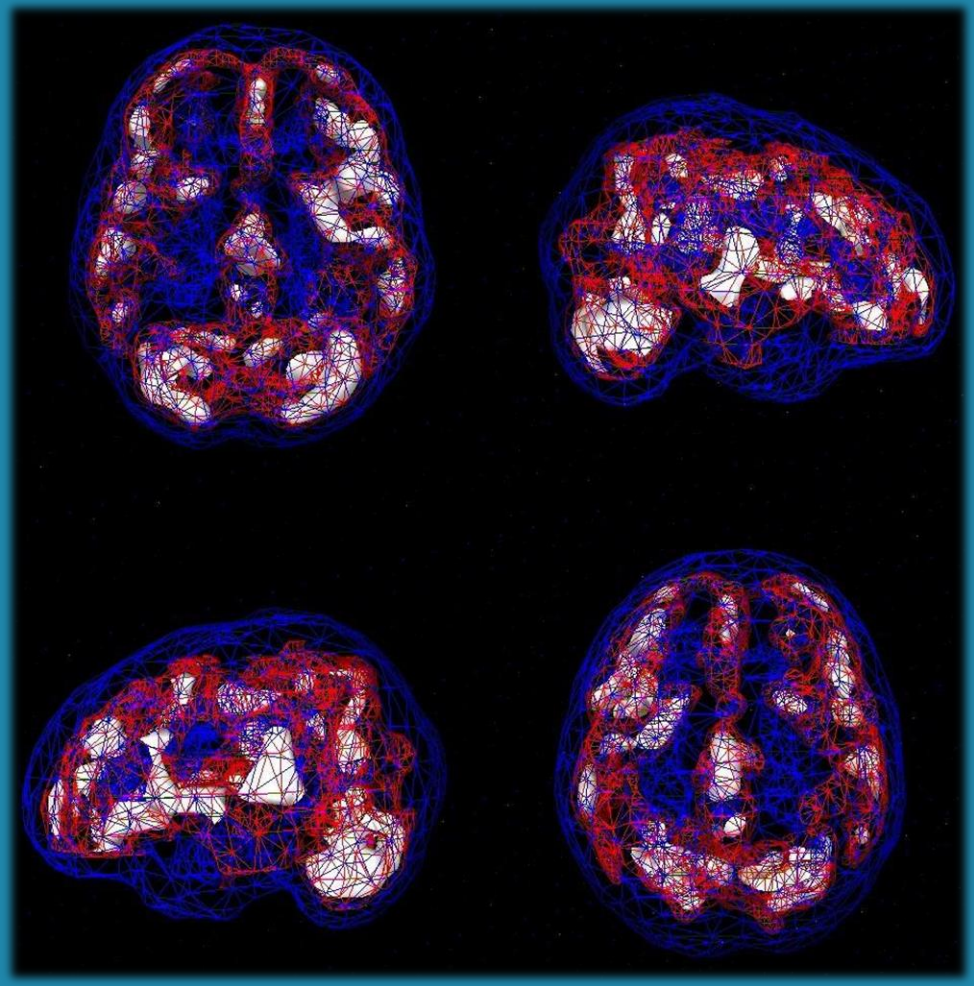
Overall Increased Perfusion

- Bipolar disorder/mania
- Inflammatory process, i.e., SLE
- ADHD that is typically made worse by stimulants



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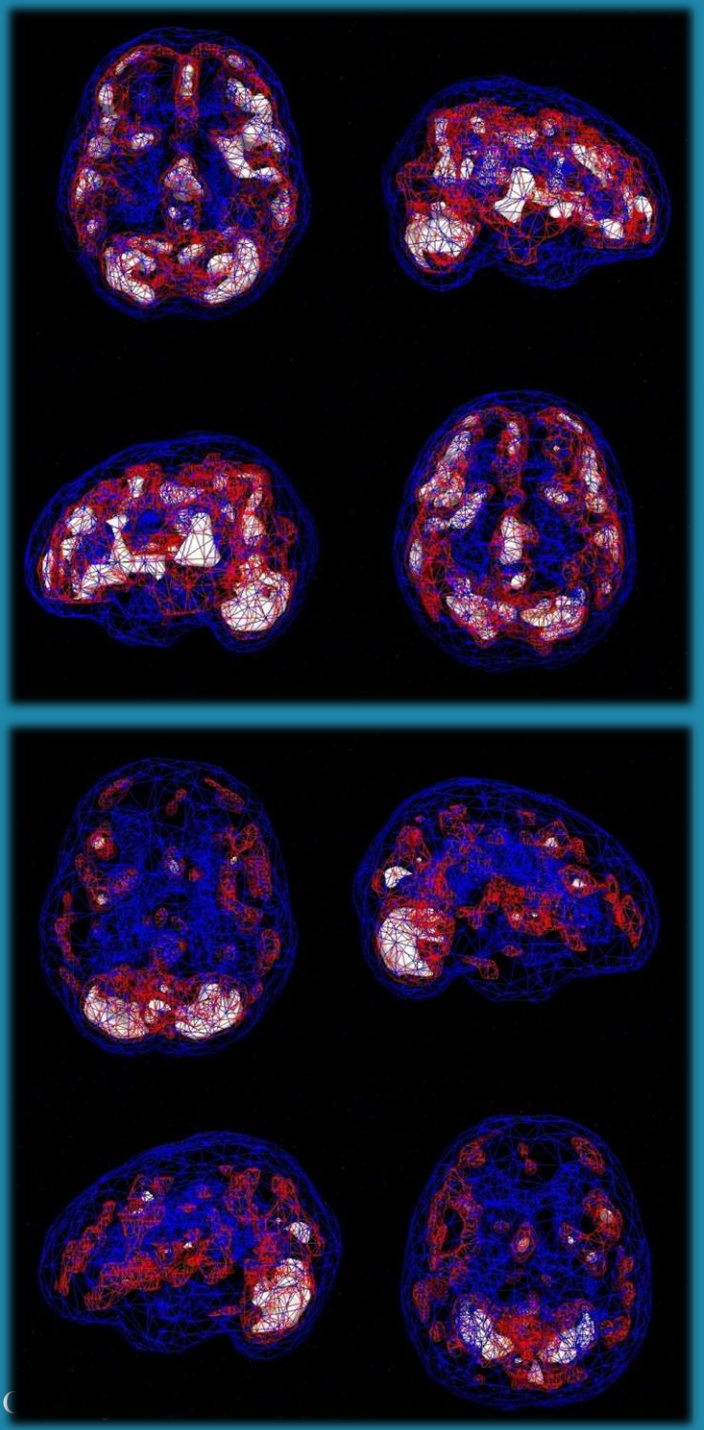
Overall Increased Interventions

- Work up and treat potential inflammation, such as SLE or food allergies
- Eliminate allergens
- Calming interventions, such as magnesium, GABA, or anticonvulsants



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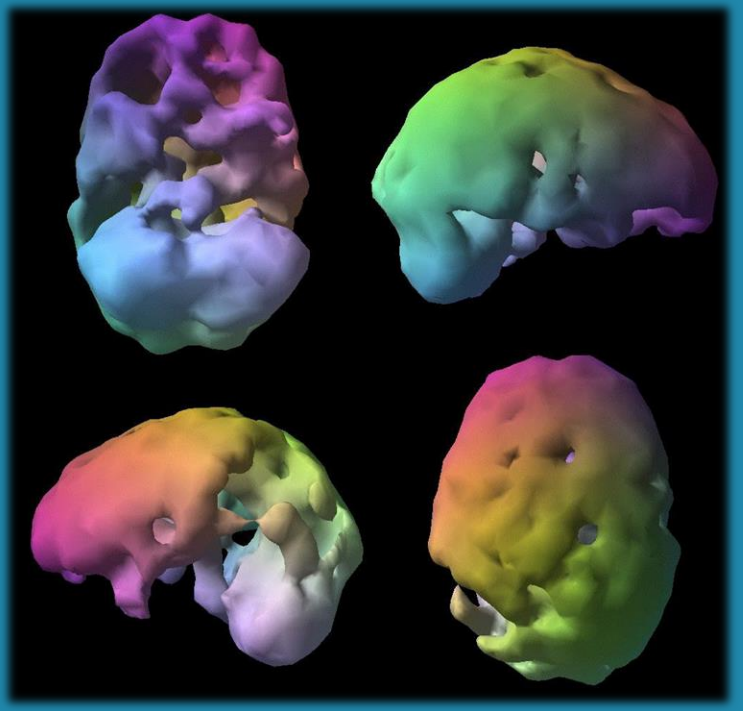
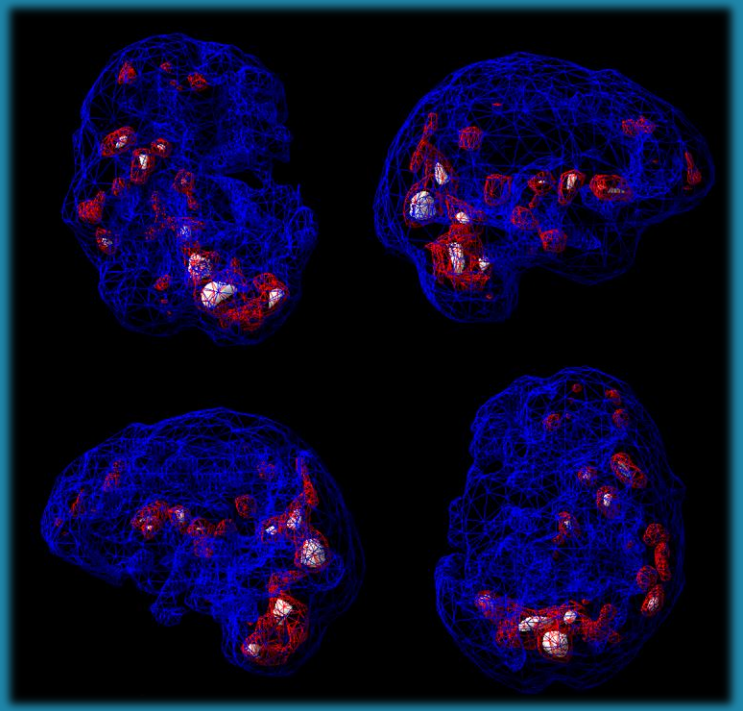
Traumatic Brain Injury

More Common

- Focal deficits
- Asymmetries
- Prefrontal cortex flattening
- Decrease temporal poles
- Contra-coup sites
- Crossed cerebellar diaschesis





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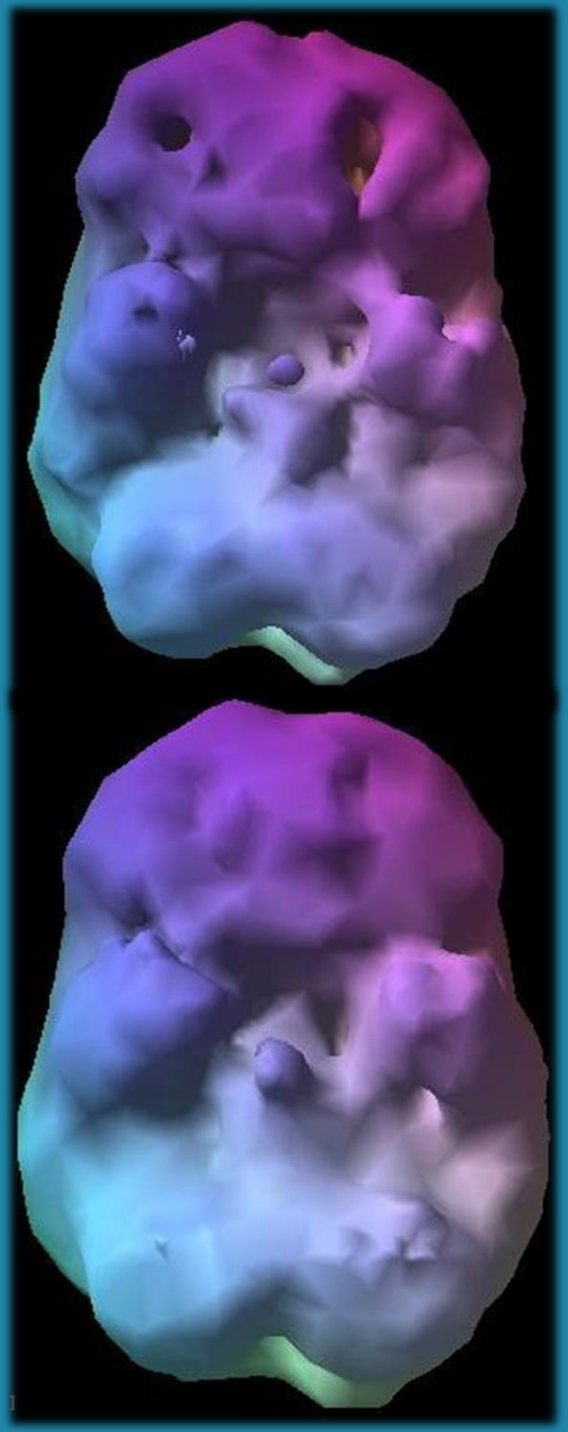
TBI Interventions

Brain Rehab Program

- Avoid Bad
- Do Good
- Neurofeedback
- HBOT
- Meds or supplements that are area specific



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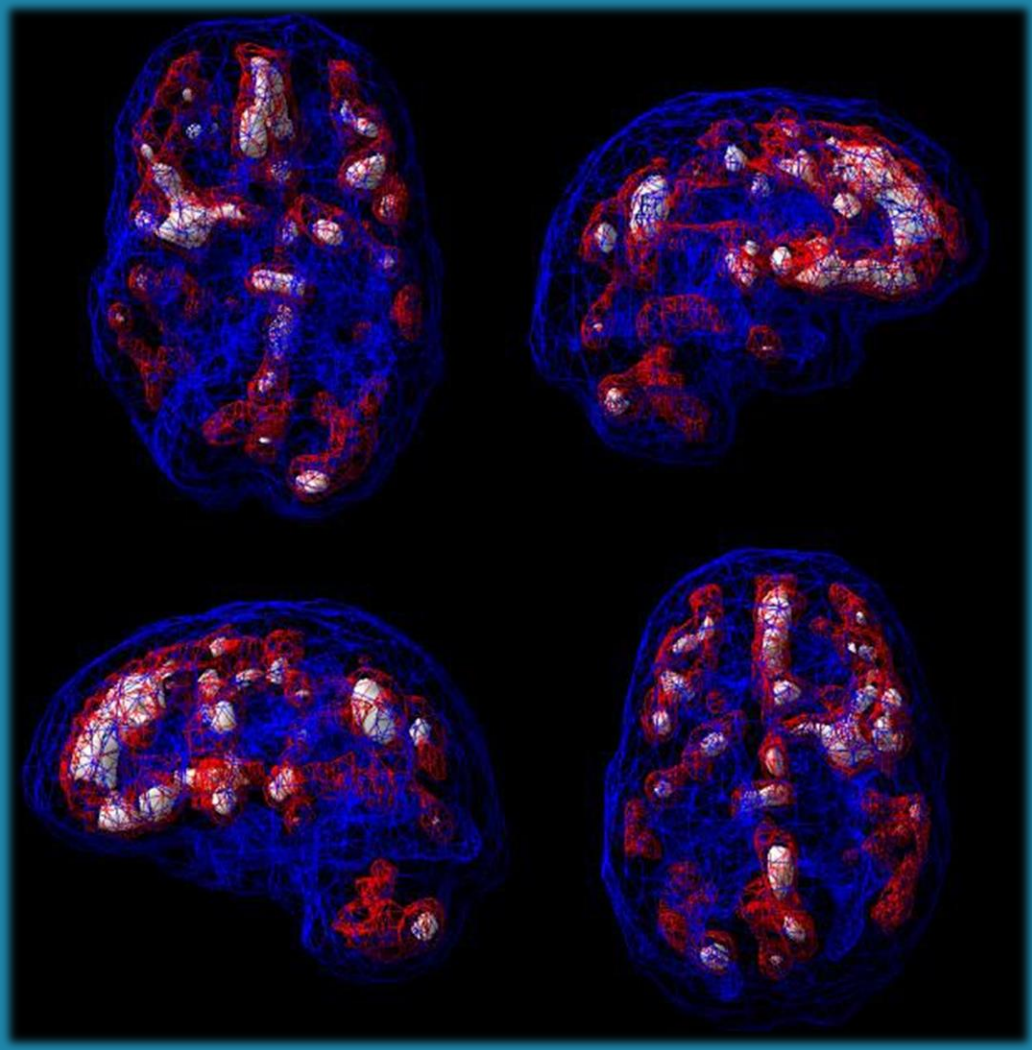
Hyperfrontality

- OCD spectrum
- ODD
- Autistic spectrum
- Get's stuck, worried, rigid, inflexible
- Overfocused depression or anxiety



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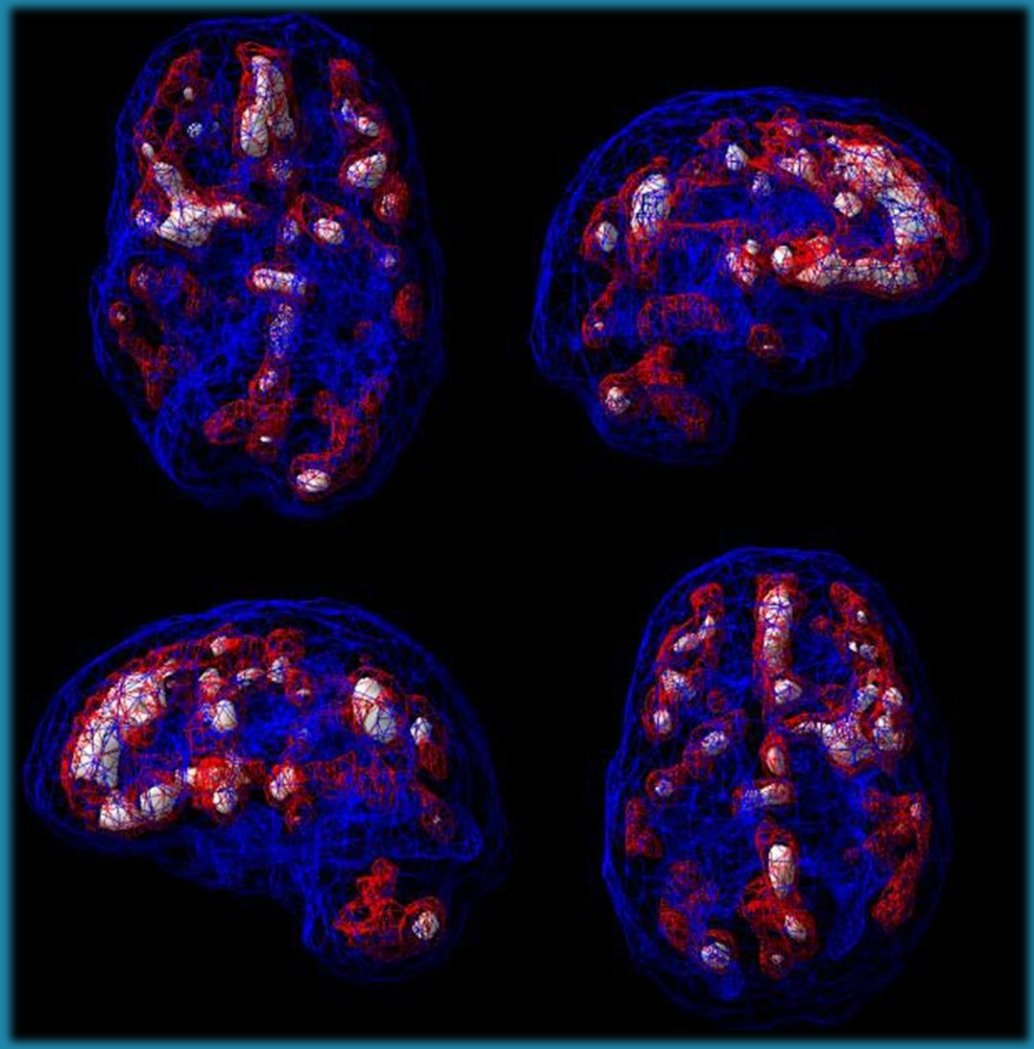
High PFC Interventions

Increase Serotonin

- Exercise
- Supplements such as 5HTP or St. John's Wort
- SSRIs
- Risperdone



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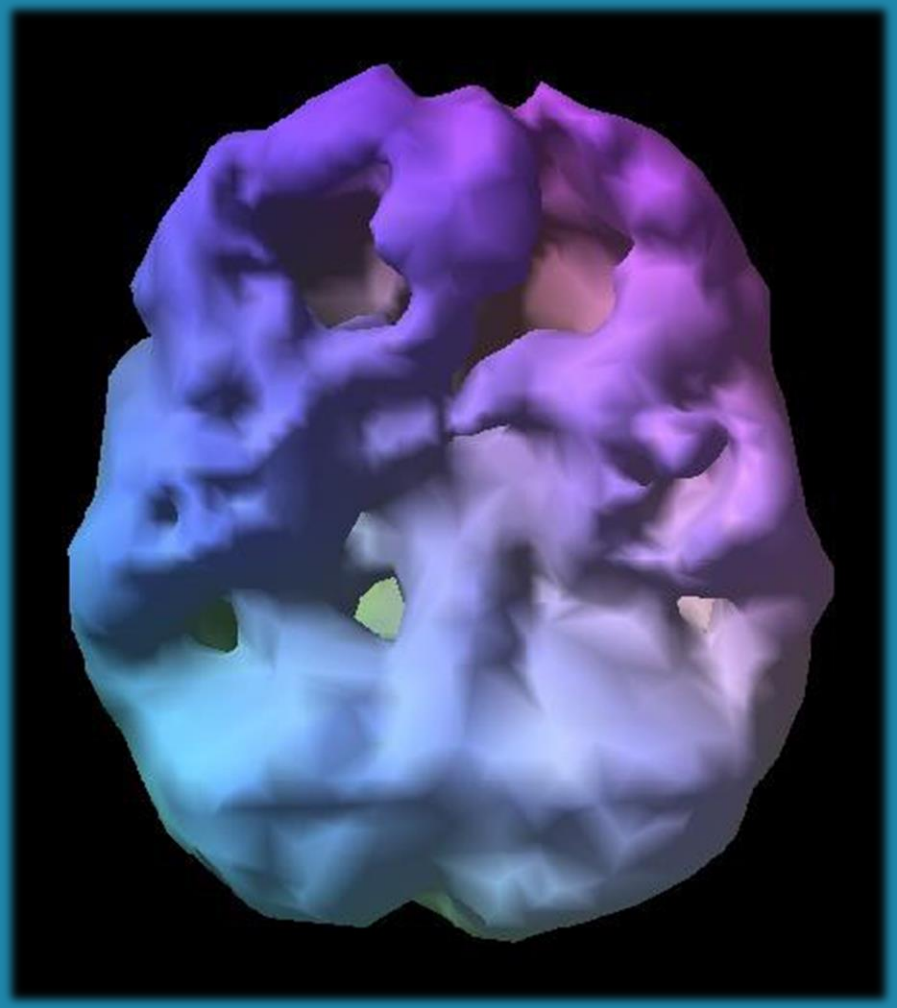
Hypofrontality

- ADHD
- Schizophrenia
- TBI
- Medications
- Predicts relapse in alcoholics
- Lack of conscientiousness
- Forms of depression



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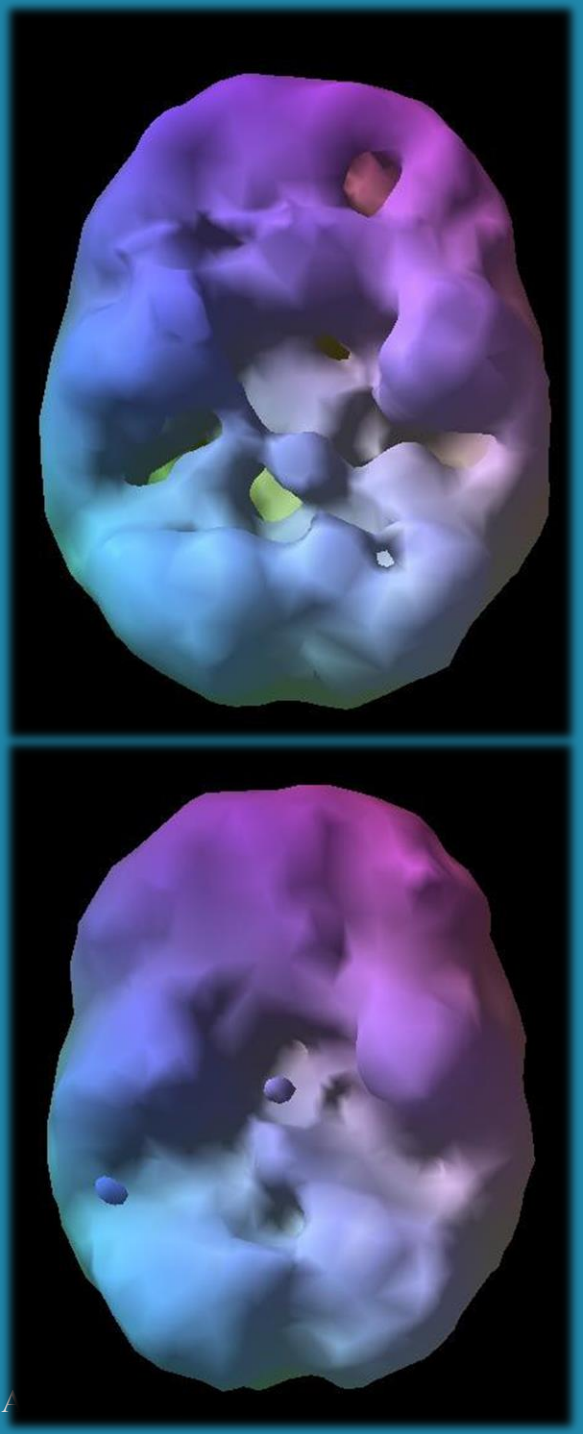
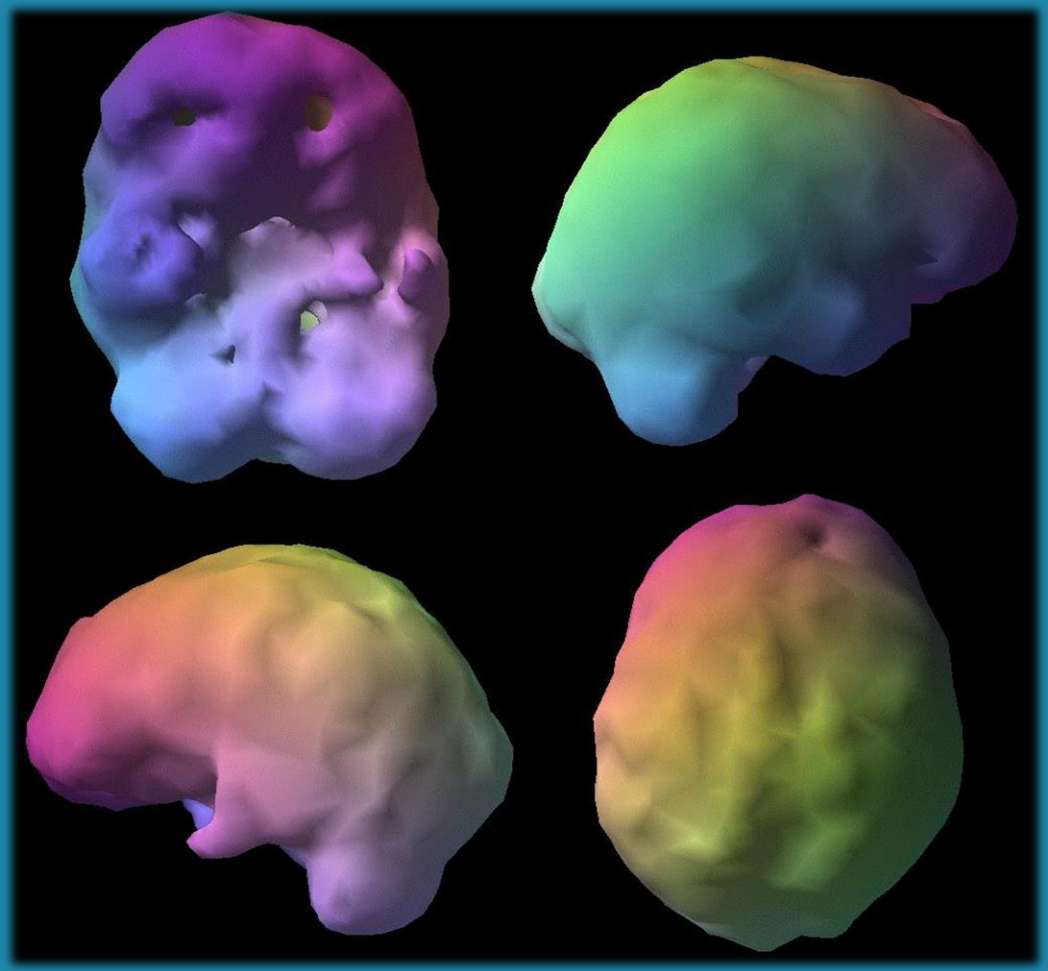
Low PFC Interventions

- Exercise
- Stimulating supplements, such as green tea, l-tyrosine, rhodiola
- Stimulants if ADHD
- Stimulating antipsychotics if needed, Abilify
- Stimulating antidepressant or SAMe if depressed
- Brain rehab if needed



Temporal Lobe Hypoperfusion

- TLE
- TL dysrhythmia
- Dyslexia
- Mood instability
- Intermittent explosive disorder



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TL Interventions

- Ketogenic diet
- Neurofeedback
- HBOT
- Anti-epileptic meds
- Memory enhancing supplements – gingko, vinpocetine, huperzine A
- Memory enhancing meds

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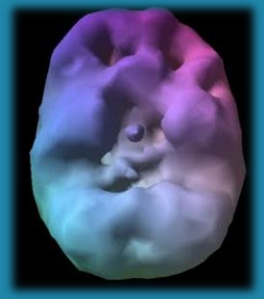
Research Sample – Brain Trauma



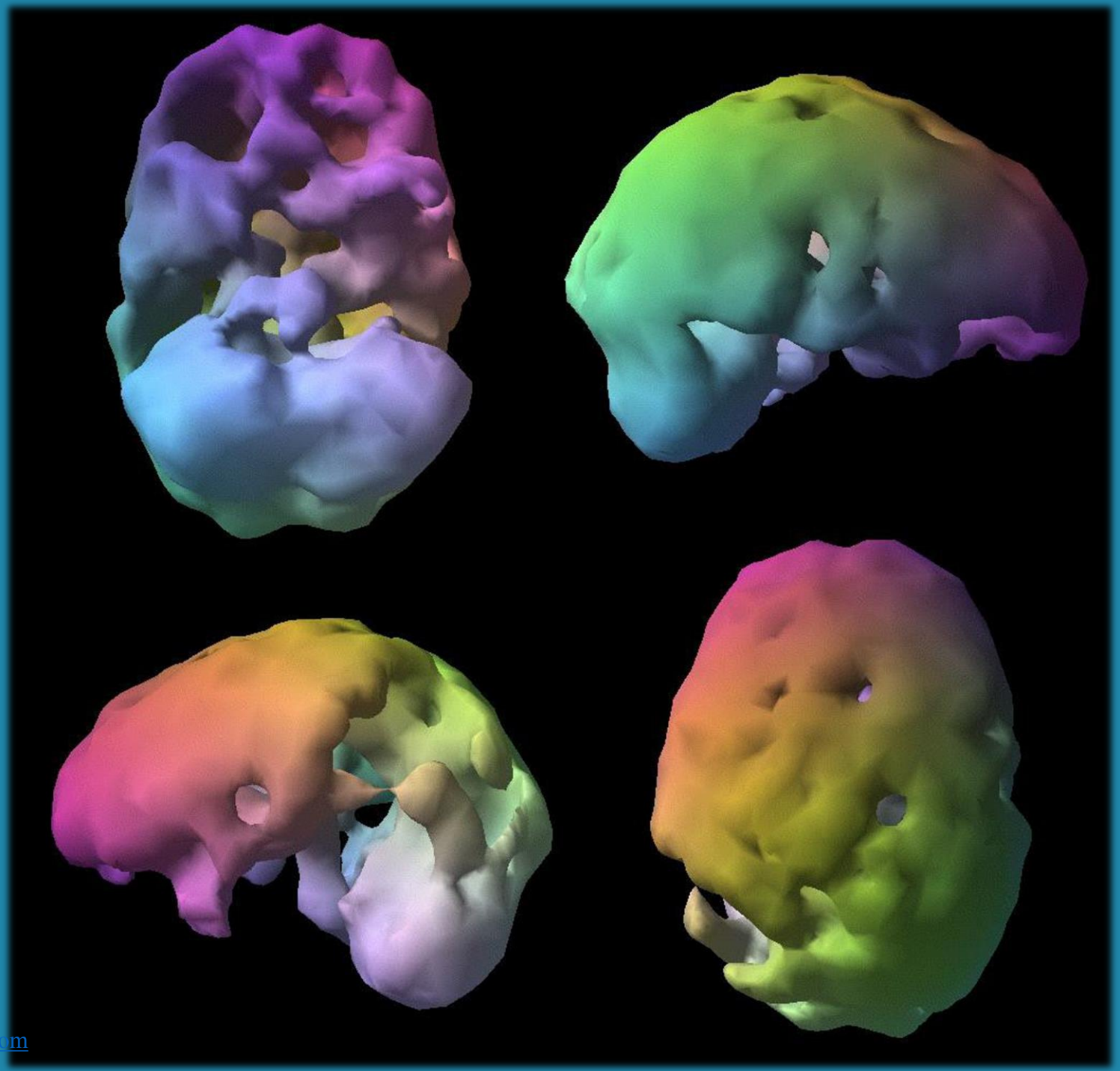
- 107 studies on 3,335 subjects
- Abdel-Dayem, 1998, 228 patients
  - 41 patients who had mild TBI without LOC had normal CT, 28 SPECT studies were abnormal
- Jacobs, 1996, 136 patients
  - a normal SPECT scan is a reliable tool in the exclusion of clinical sequelae of mild head injury. At 12 months postinjury, a positive SPECT study is also a reliable predictor for clinical outcome.

Research Sample – Brain Trauma

Abu-Judeh, 1999, 32 patients

- SPECT valuable and sensitive for evaluation of rCBF changes following mild TBI;
- these changes can occur without loss of consciousness;
- SPECT is more sensitive than CT in detecting brain lesions; and
- changes may explain a neurological component of the patient's symptoms in the absence of abnormalities using other imaging modalities.

Brain Trauma



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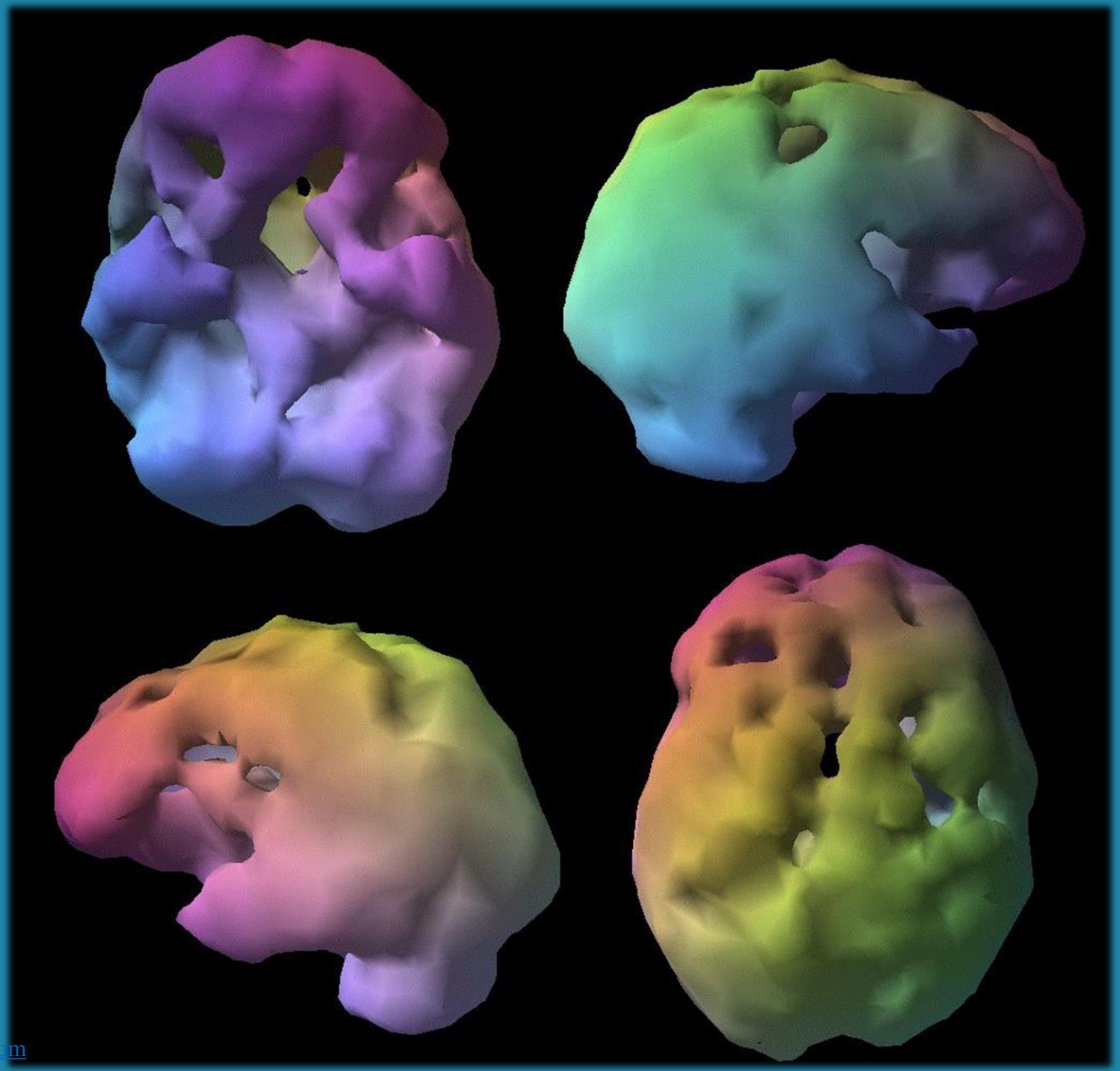
Research Sample – Dementia

- 210 studies on 13,261 subjects
- Jobst, 1997, 319 AUTOPSY CONFIRMED
  - SPECT alone had 89% sensitivity, 80% specificity, and 83% accuracy; and the combination of SPECT and CT was 80% sensitive, 93% specific, and 88% accurate.
- Hirao, 2006, 122 patients
  - SPECT changes in posterior cingulate cortex closely related to entorhinal cortex in patients with AD
- Borroni, 2006, 31 patients
  - SPECT pattern and severity of memory deficits predict risk of progression to probable AD in MCI subjects.

Dementia



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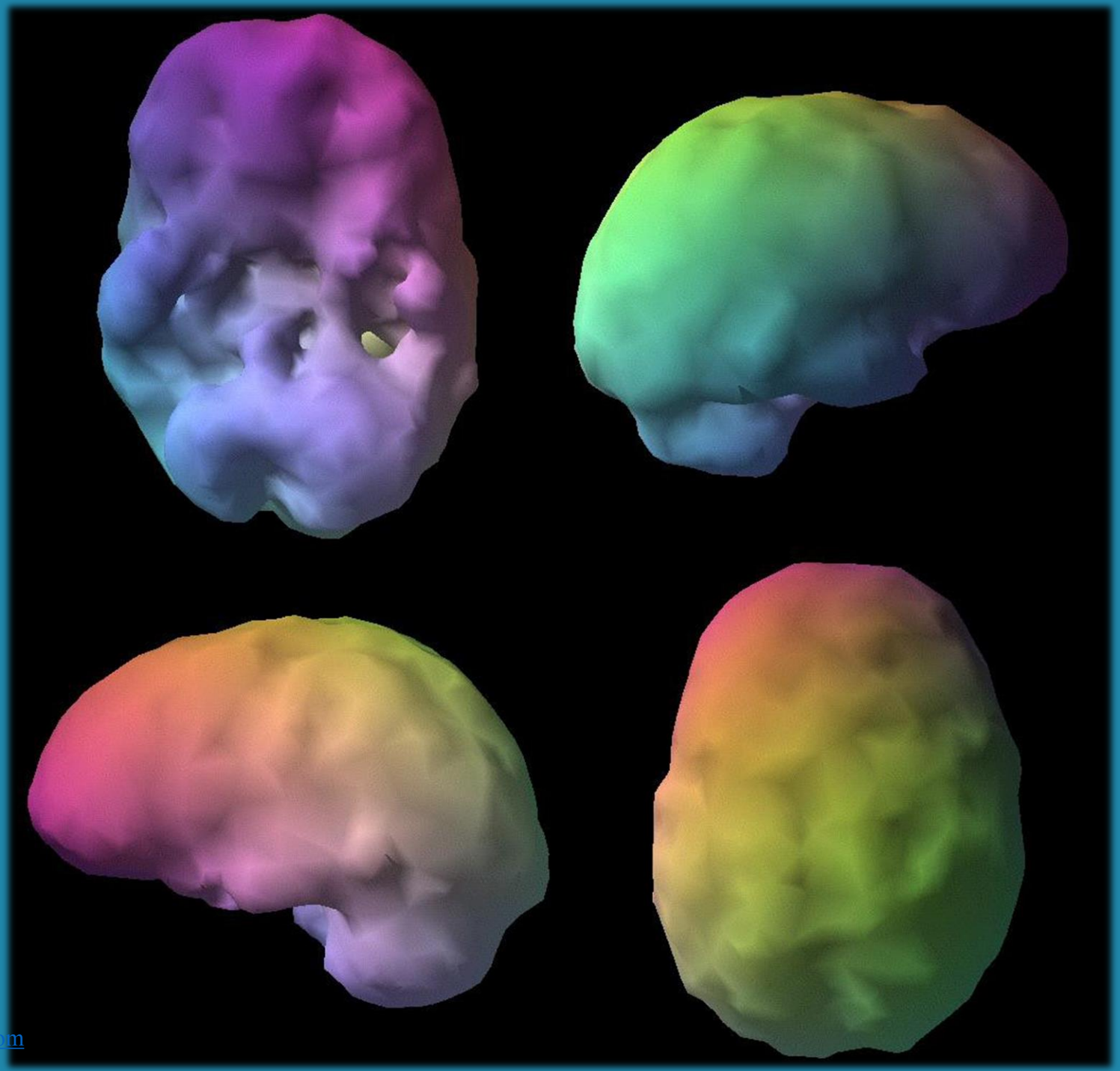
Research Sample – Epilepsy

- 253 studies on 7,382 patients
- Devous, 1998, META-ANALYSIS OF 46 PAPERS
  - SPECT localization with TLE -- 0.44 (interictal), 0.75 (postictal) and 0.97 (ictal).Low false-positive rates relative to diagnostic evaluation (7.4% interictal, 1.5% postictal)
- Won, 1999, 118 patients
  - MRI, PET, and ictal SPECT correctly identified lesions in 72%, 85%, and 73% of patients

Epilepsy



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