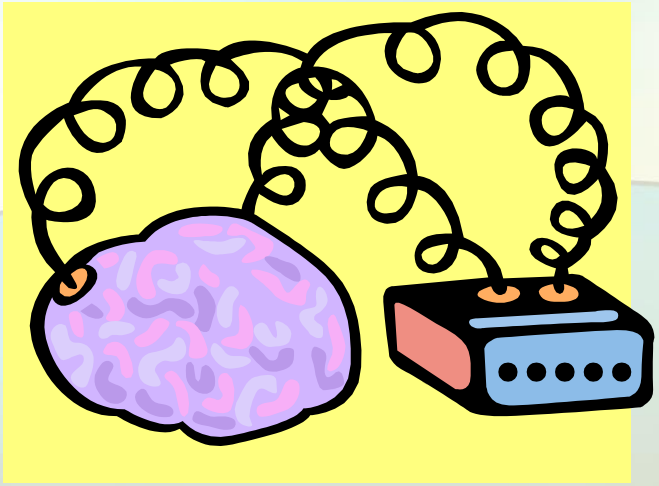
NEUROFEEDBACK



An Effective Intervention for Emotional & Behavioral Issues

Presented by

Donna Creasy

LPC, LMFT

Board Certified in Neurofeedback

Associate Fellow, BCIA

with assistance from **Lynn Gibbons**,

Resident in Counseling

Board Certified in Neurofeedback

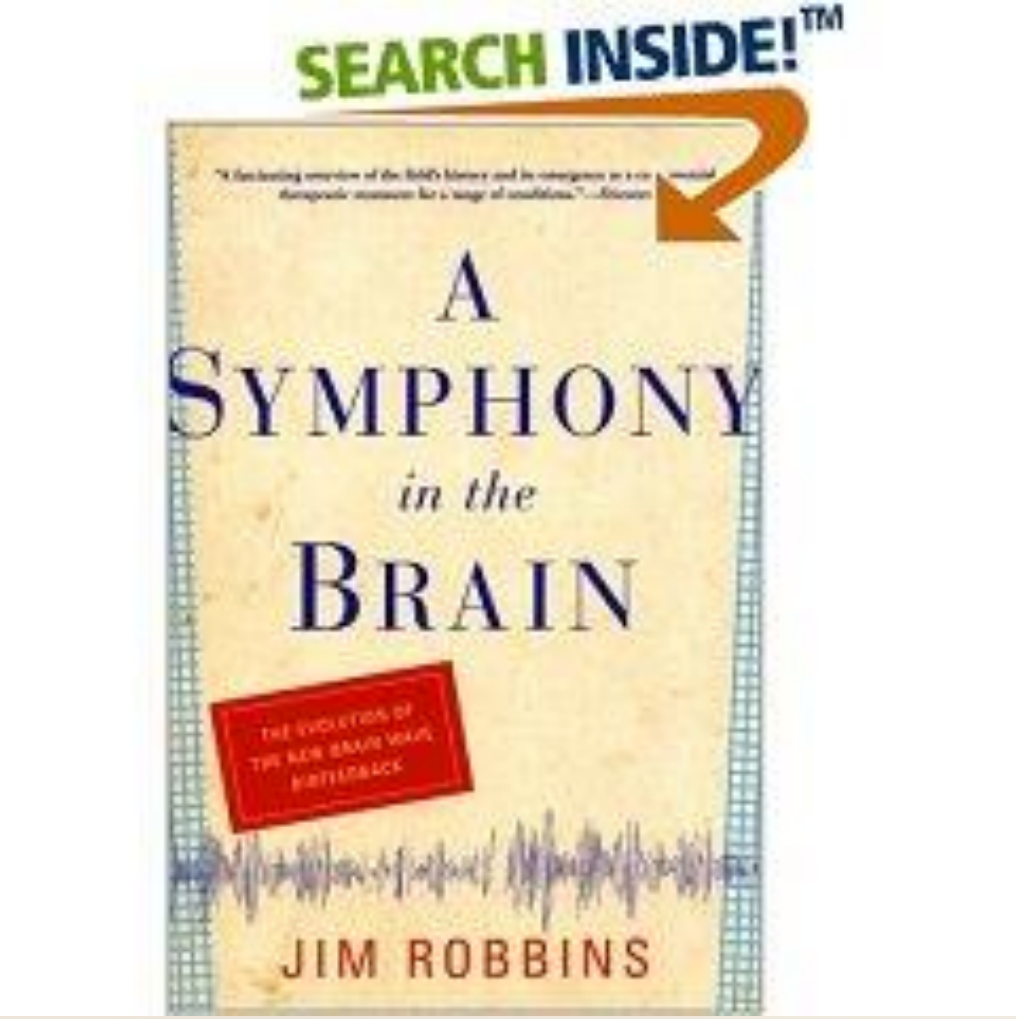
DISCLOSURES

- I am retired (mostly) from Prince William Community Services but have an on-going relationship regarding oversight of neurofeedback services.
- I am a trainer for the BCIA Neurofeedback "Boot Camp" through Stress Therapy Solutions.
- My retirement mission is to spread the word about NFB and to help health care professionals incorporate it into their practices.

Questions…

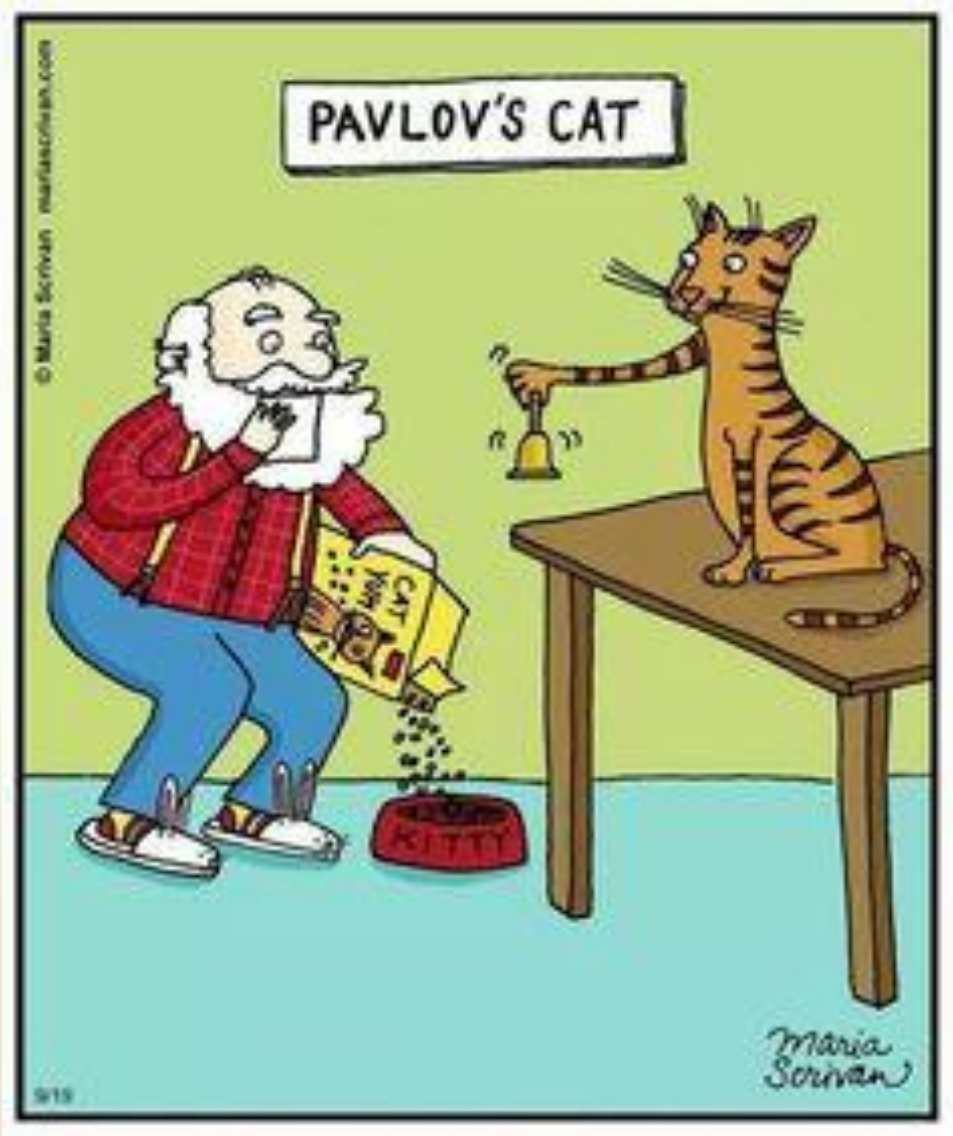
- What is neurofeedback?
- How does it work?
- What's it good for? How can it help youth with serious problems?
- What are the COSTS?
  - Equipment
  - Training
- What does it take to get certified?
- How can I get NFB mentoring?

What is neurofeedback?


SEARCH INSIDE!™
A
SYMPHONY
in the
BRAIN
JIM ROBBINS

NFB Research began in the 1960s

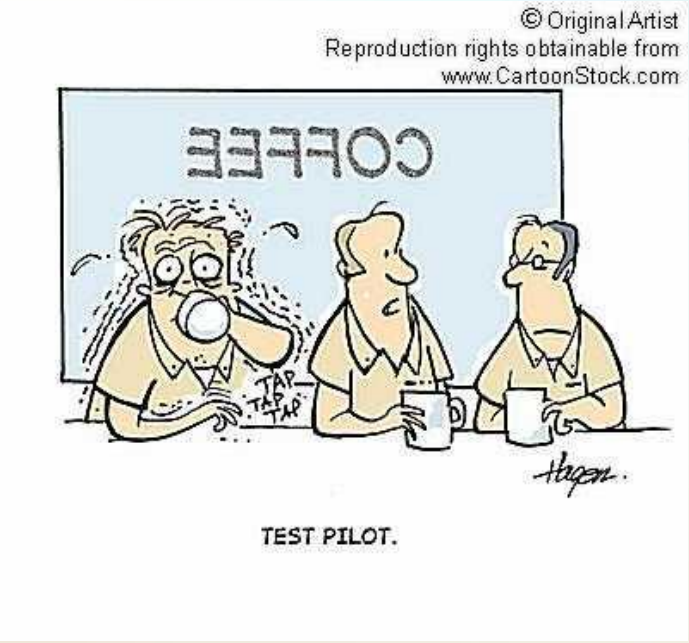
- Barry Sterman (UCLA) trained cats to increase SMR rhythms (calm focus) in their brains using operant conditioning.
- Published in Brain Research, 1967


PAVLOV'S CAT
KITTY
Maria Scrivan

Test pilot research

Critical: able to shift quickly between calm focus & concentrated problem-solving

Concentration/Relaxation Cycle



NASA Study re: rocket fuel effects

- Studied seizure activity in cats exposed to rocket fuel.
- Some cats were seizure-resistant! They were cats from the earlier experiment, trained to produce SMR.

Sterman wondered…Would NFB help humans with seizure disorders?

Yes! His research showed a decrease in severity & frequency of seizures with SMR training. NFB is medically approved for treating epilepsy today.

ADHD symptoms also improved – which led to studies in the 1970s using NFB for ADHD , notably by Joel Lubar at Univ of Tennessee

So what happened?

"Almost all of behaviorism was abandoned in favor of pharmaceuticals in the 1970s, and biofeedback is barely a blip on the radar screen of modern medicine." *Jim Robbins, author*

Barry Sterman's work demonstrated the

plasticity of the brain

(lifelong capacity for growth & renewal)

This concept was revolutionary, a whole new paradigm!

But it dropped off the map. Why?

- Came out of psychology instead of the medical world
- Suffered from bad reputation earned by biofeedback among scientists because of wildly speculative claims
- Conflict among the pioneers
- Cost of equipment & computer capability in early decades

Neurofeedback is also called…

- EEG Biofeedback
- Brain training
- Neurotherapy
- Neuro-training
- Attention training
- Peak performance training

How does neurofeedback work?

BIOFEEDBACK

Using information about how the body is working to change what's going on

Biofeedback was popular in the 70's for managing anxiety.

The client got sound tones for rewards when his GSR (Galvanic Skin Response) reflected lower stress levels.

Every day forms of biofeedback

You have to have accurate feedback, of course!

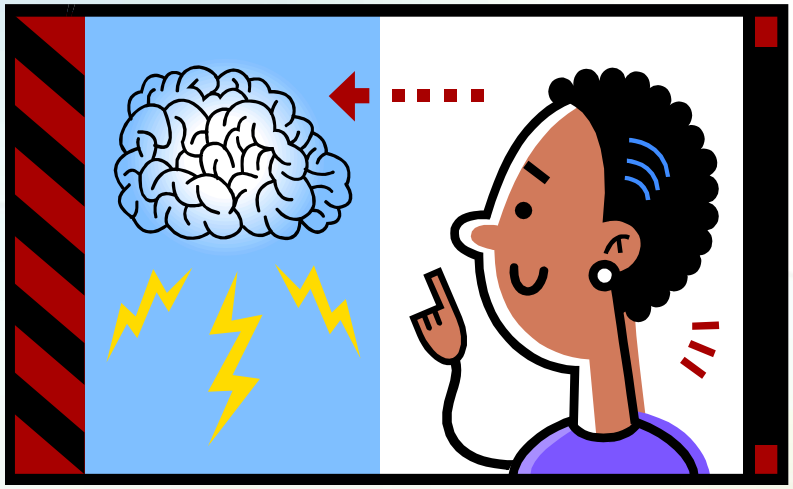
Brain training is… exercising the brain- a mental workout. Technically, it's considered operant conditioning.

We now know our brains are much more "plastic" than we used to think.

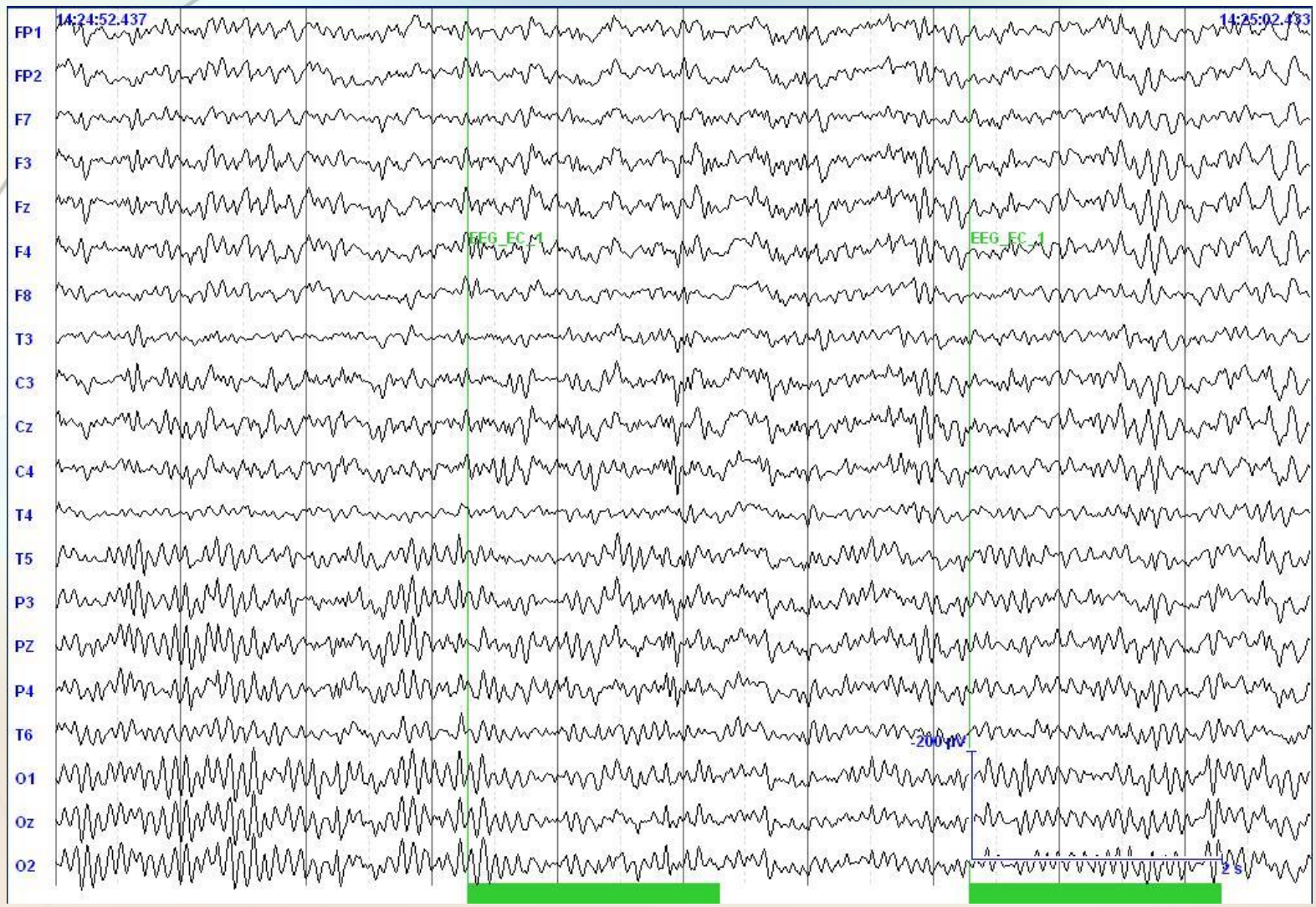
Our brains can

- learn,
- change,
- improve,
- heal…

THE BIG IDEA:

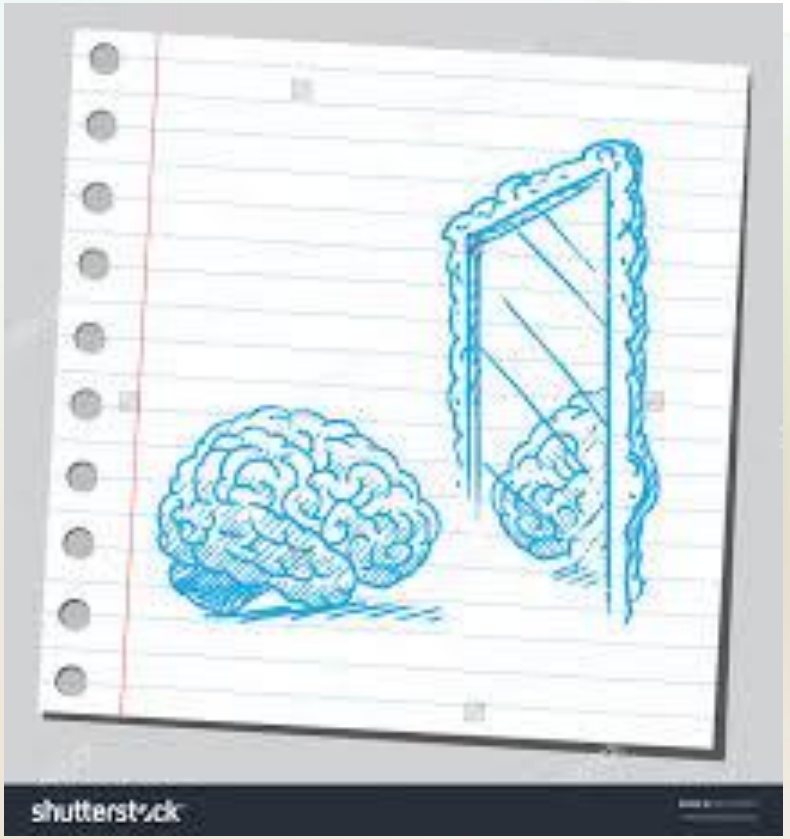


When you have information what your brain waves are doing, your brain can use that information to change how it works.



You can train

Neurofeedback is like holding a mirror up to the brain…



Training your brain is a lot like training your dog!

ISSUES:

- Communication
- Behavior management – rewards > effective

We do the same thing with the brain – the software tells the client when the brain is doing what we want it to do.

The brain likes rewards – does more of what generates them.

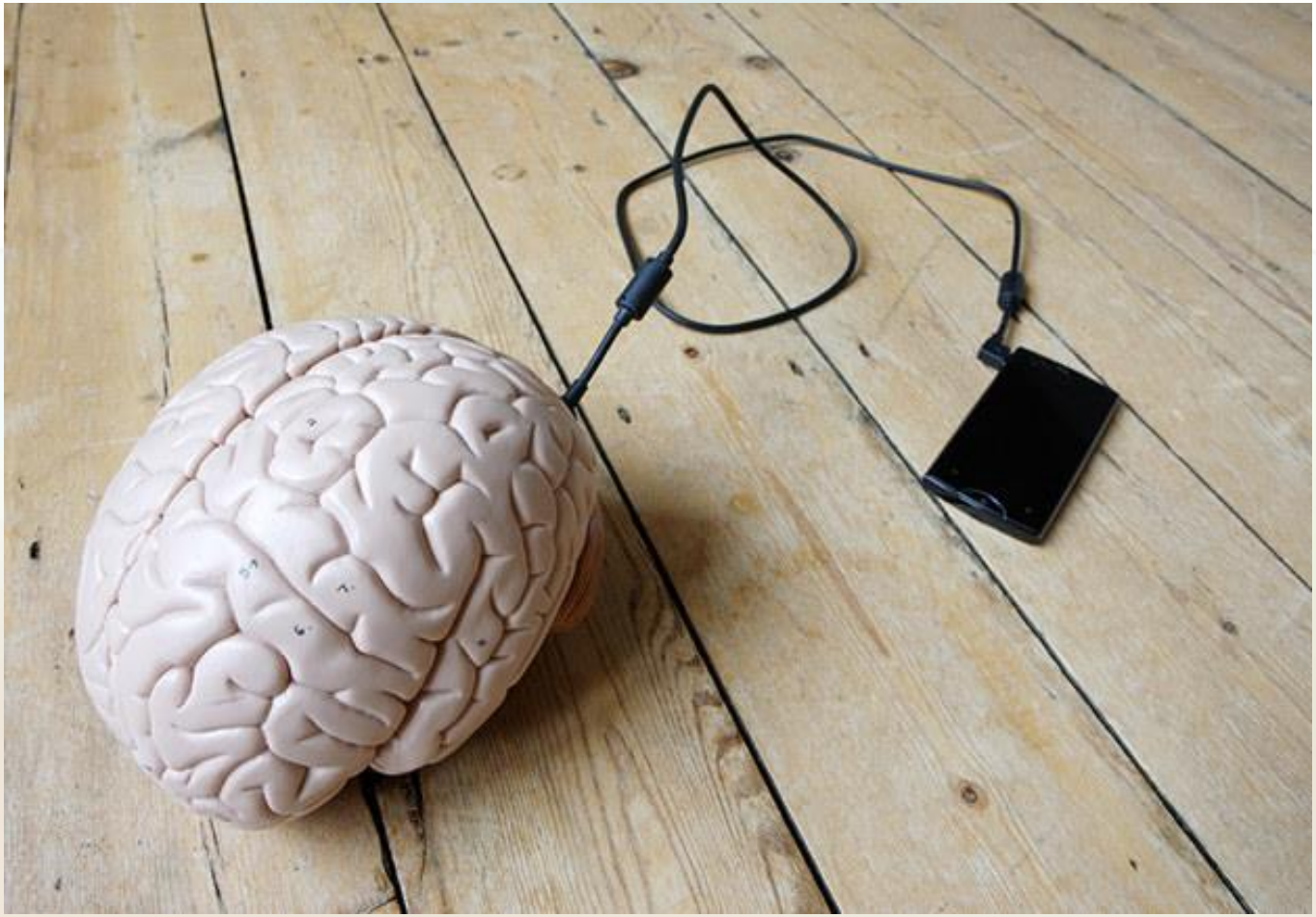
Your brain uses about 20-30% of your body's basic energy -

and about 20% of your oxygen.

A human brain makes enough electricity to light

a 30-watt light bulb!

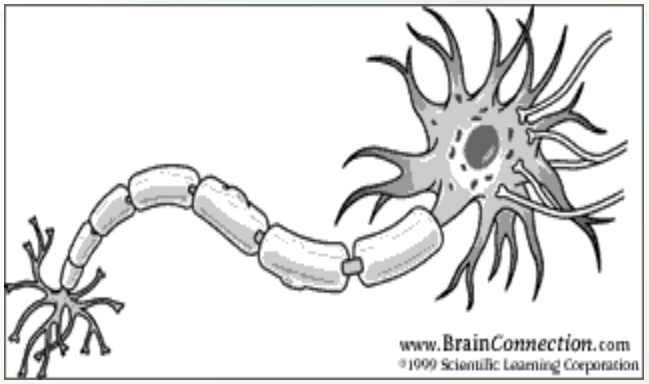
Update on brain energy



By age 20-25, we have 100 billion neurons…

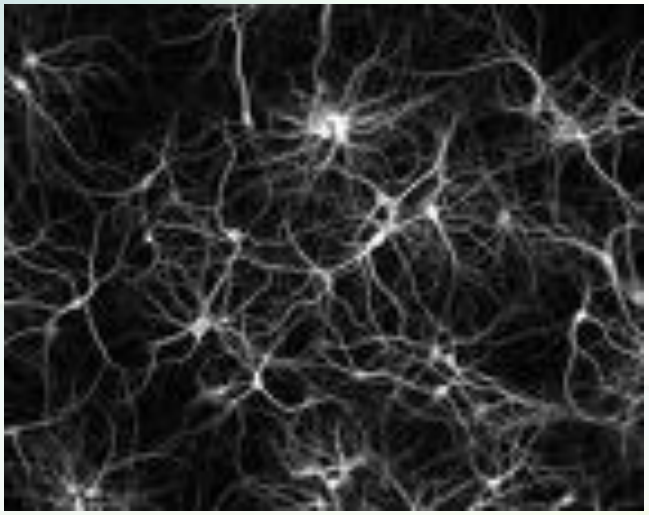
After that, we start to LOSE brain cells.

As many as 10,000 brain cells die every day after age 20.



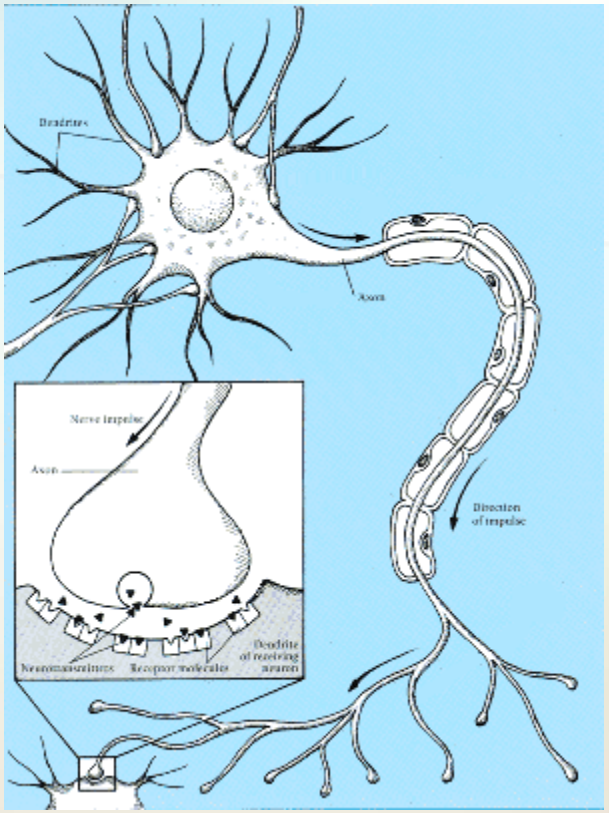
Fortunately, those 100,000,000,000 neurons are a generous supply!

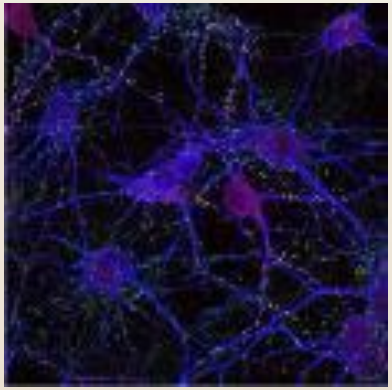
Every neuron is connected to other neurons –

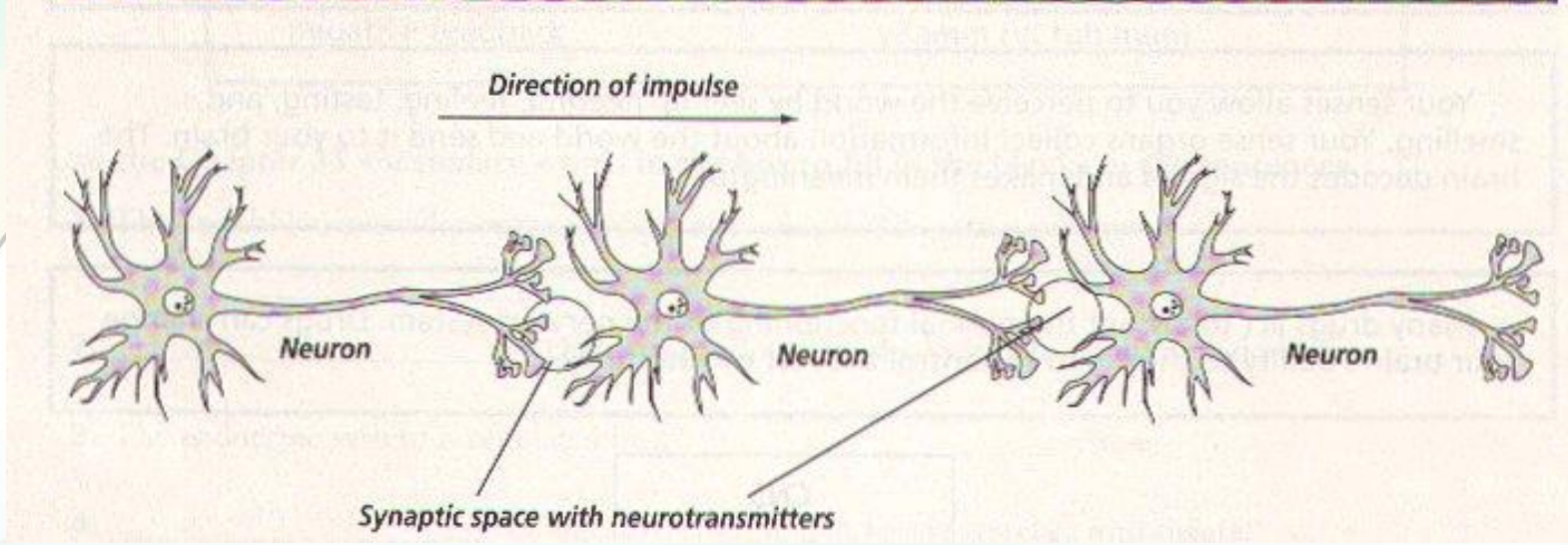


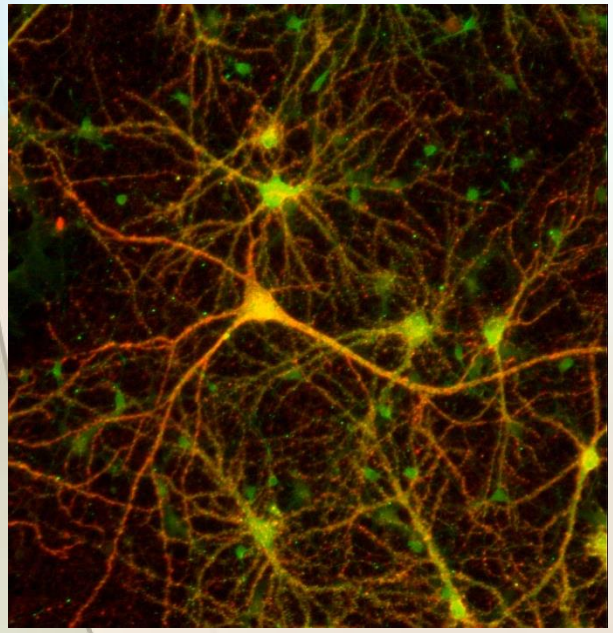
we have an estimated
1,000,000,000,000,000
(a million billion)
connections in our brain!

Brain cells produce electrical signals that affect the brain's chemistry.









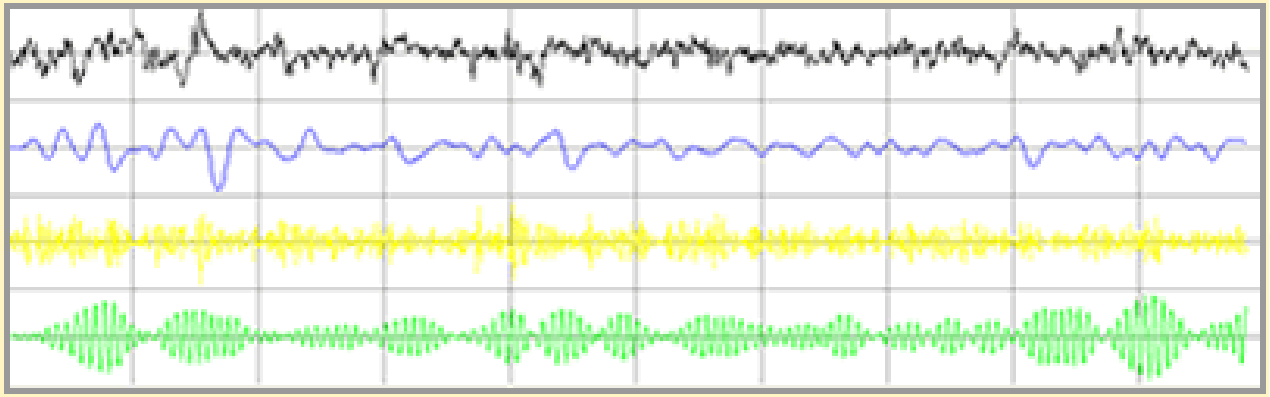
The electricity reflects normal cell activity as information is transferred from cell to cell.

We can detect this electrical activity using sensors (electrodes) placed on the scalp.

These electrodes pick up information about brain activity --

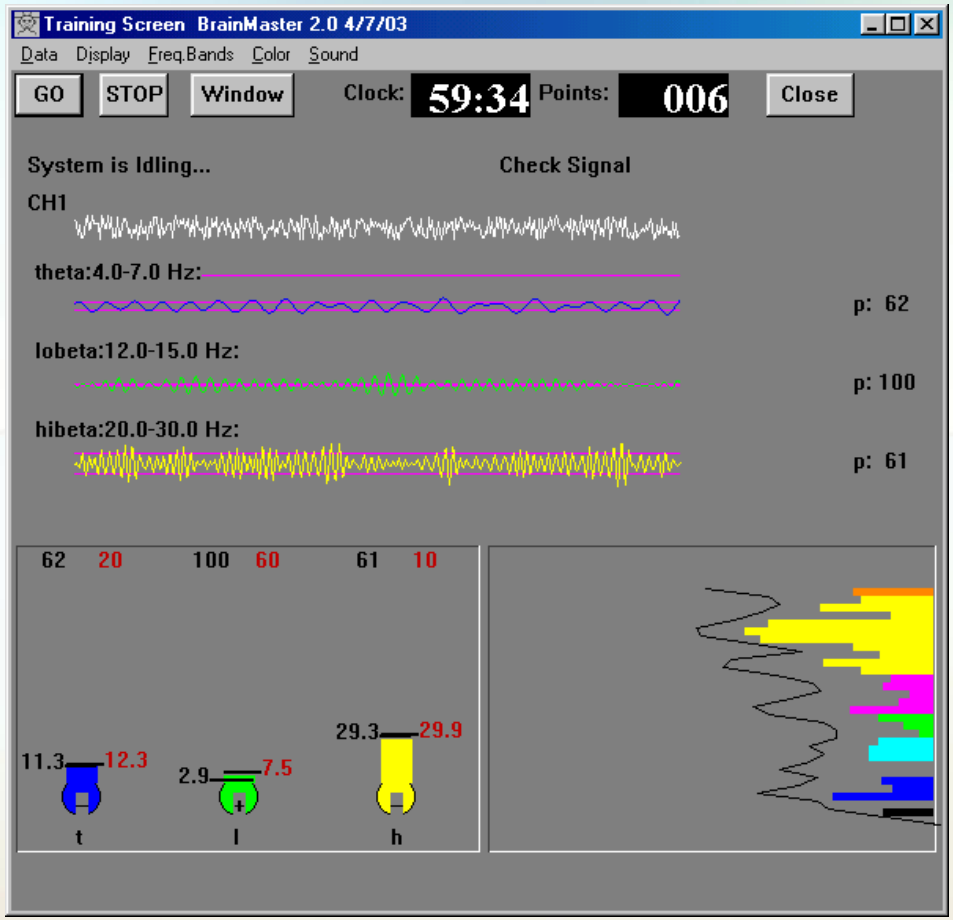
similar to the way stethoscopes pick up information about our hearts and lungs.

In both situations, SENSORS are gathering data.



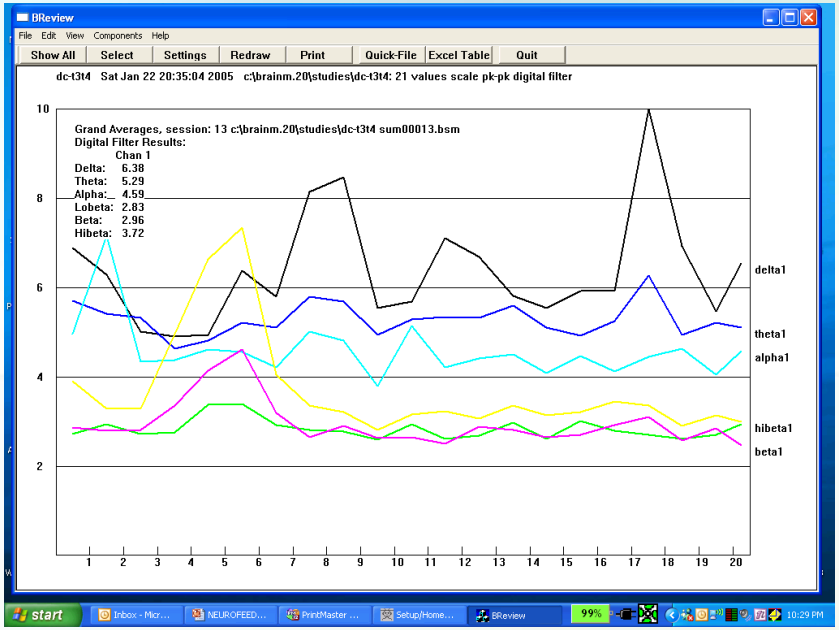
The signal is VERY tiny, measured in microvolts – about 1 millionth of a volt.

This electrical signal is then magnified by an amplifier, which is then fed through a computer.



BrainMaster training screen

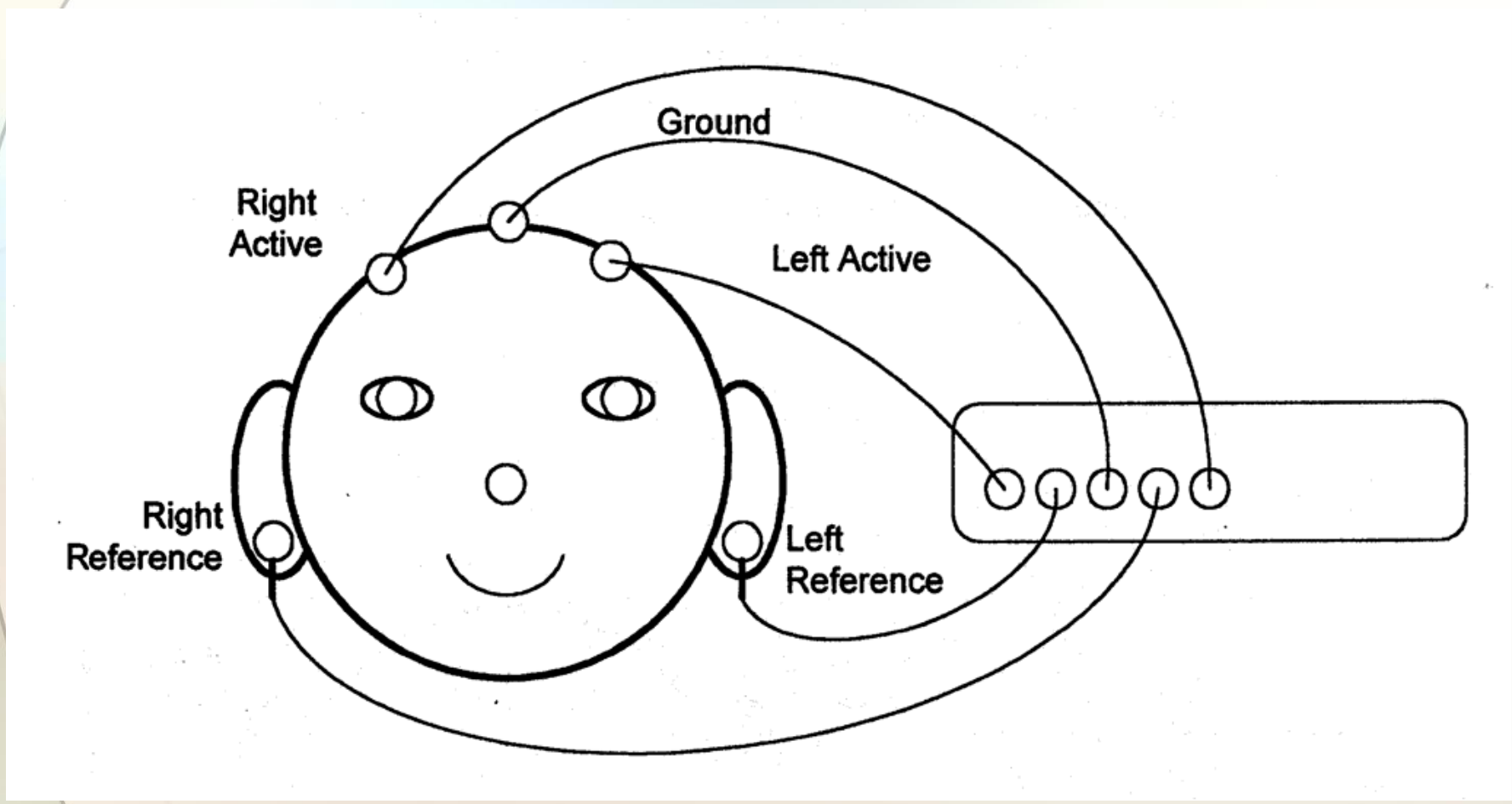
Special computer software can filter out the various brain wave frequencies & provide this information in a usable form.

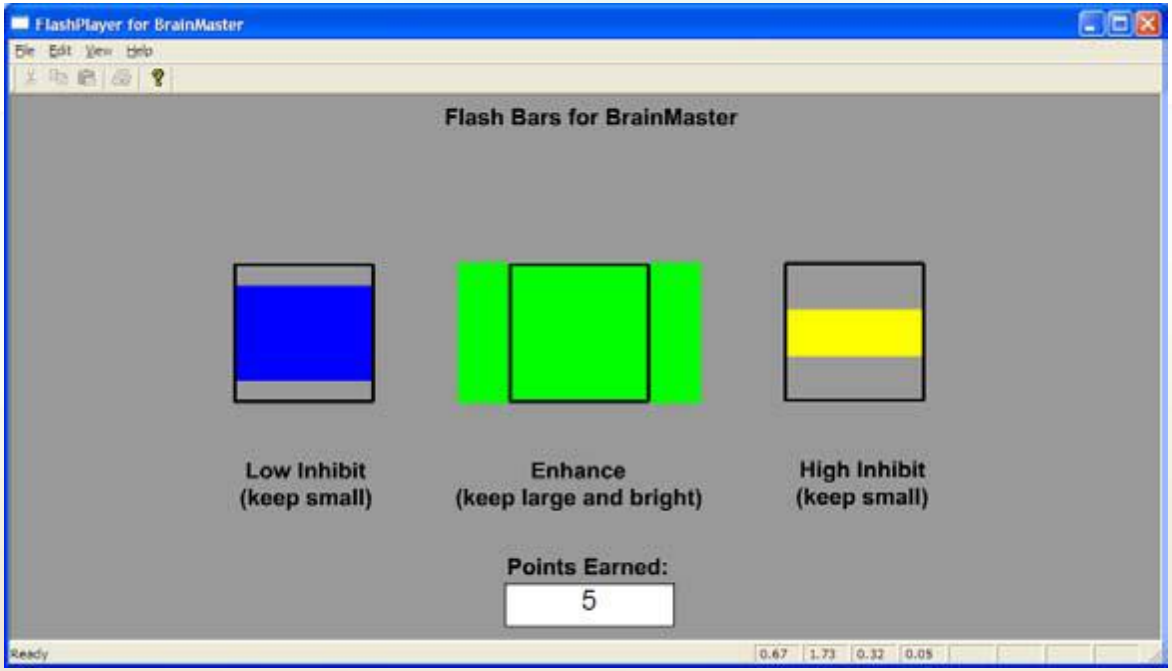


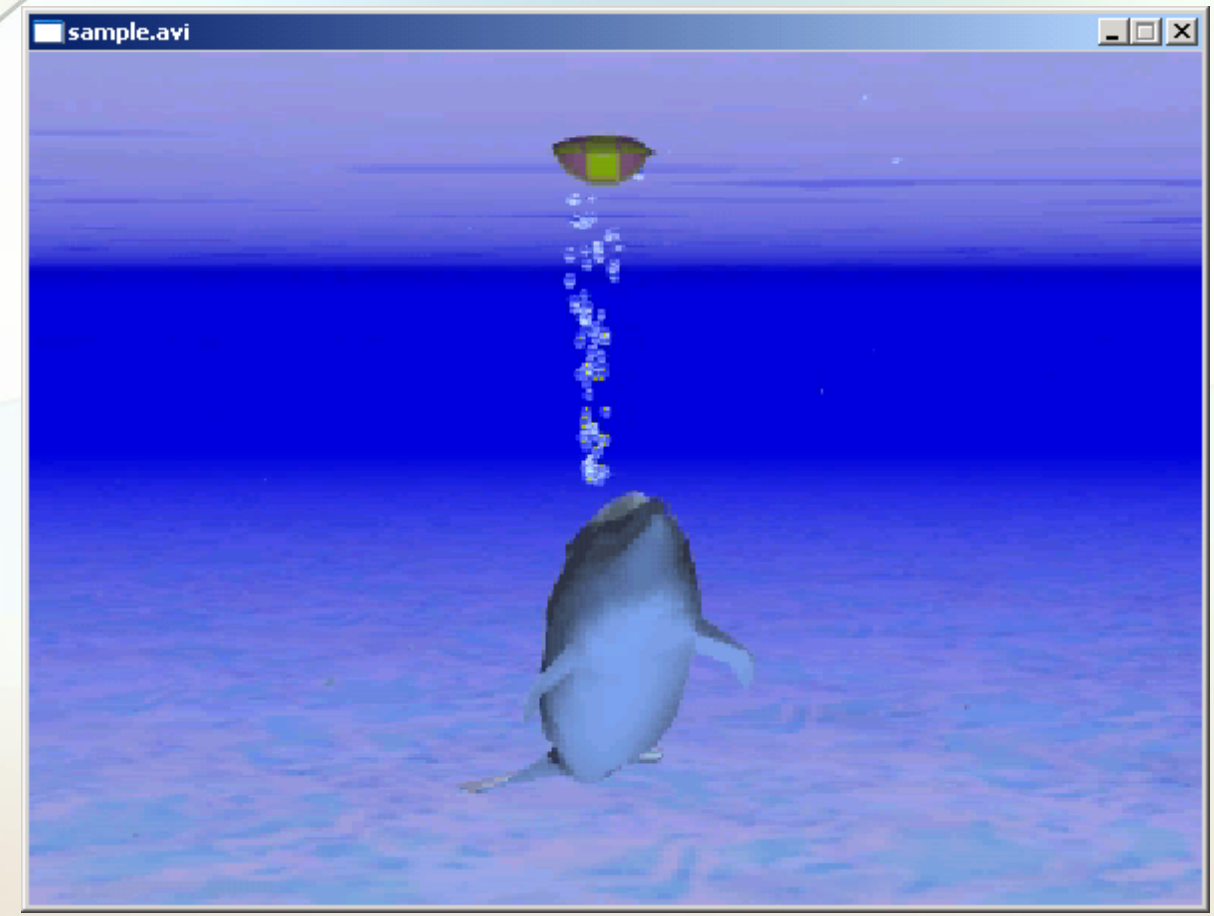
BrainMaster review screen

The patterns of brain wave activity vary, depending on where on the brain we are looking, and what kinds of things we are doing. In different mental states, different types of brain waves dominate.

Setting Up the Training




FlashPlayer for BrainMaster
File Edit View Help
Flash Bars for BrainMaster
Low Inhibit
(keep small)
Enhance
(keep large and bright)
High Inhibit
(keep small)
Points Earned:
5
Ready
0.67
1.73
0.32
0.05



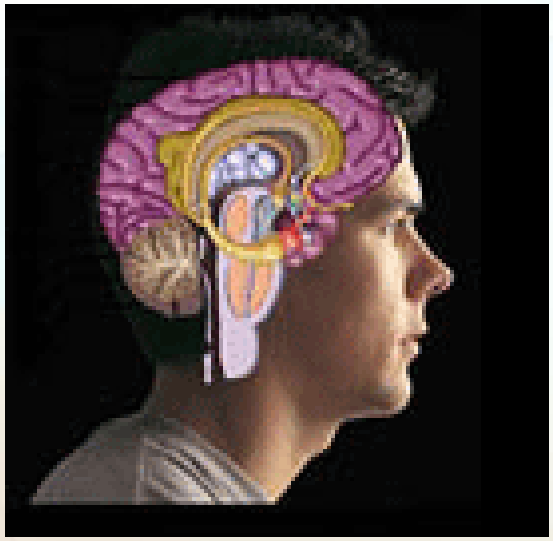
Using video for feedback: screen stays bright while brain is “on track,” goes dark when not meeting criteria. Allows for using DVDs!

What's neurofeedback good for?

Current Clinical Uses

- ADHD
- Seizure disorders
- Alcoholism/substance abuse
- Traumatic brain injury
- PTSD
- Anxiety
- Depression
- Chronic Fatigue Syndrome
- Fibromyalgia
- Chronic Pain
- OCD
- Tourette's Syndrome
- Sleep disorders
- Autism
- Asperger's
- Bipolar disorder
- Schizophrenia
- Reactive attachment disorder
- Peak Performance
- Age related memory loss
- Parkinson's
- Migraines
- PMS

Normal Brain



- Good balance of brain waves
- Ability to shift easily from one brain state to another

Dysfunctional Brain

May have

- too much of some frequencies over others
- unstable frequencies
- an impaired ability to shift from one mental state to another.

With all of these problems the real problem is the brain's impaired ability to regulate itself.

UNDER-AROUSAL

is the problem with disorders like depression and ADHD.

OVER-AROUSAL

is the problem with anxiety disorders (includes panic attacks, PTSD, agoraphobia, etc.)

INSTABILITY

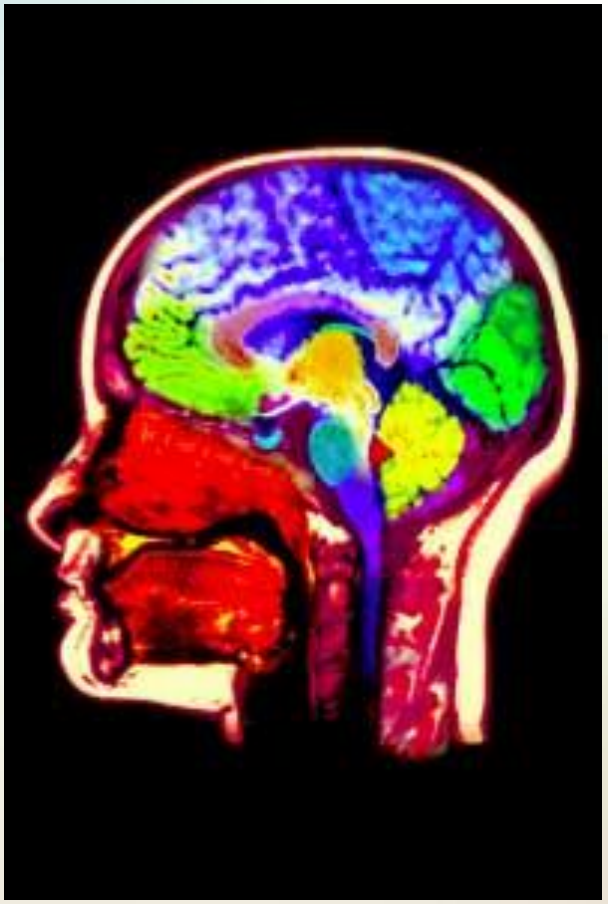
is the problem with bipolar disorder, seizure disorders, migraines.

Neurofeedback works by helping to restore

-- or create --

a better balance

of waves & activity in various parts of the brain.



Measuring
BRAIN WAVES

- **Microvolts** (μV) = Amplitude/Height of the wave **(HOW MUCH?)**
- **Hertz** (Hz) = Frequency/Speed of the wave per second **(HOW FAST?)**

FREQUENCY

- The speed of electrical undulations, measured in hertz (hz). [cycles per second]

- The frequency defines the brainwave bandwidth:
  - **Delta, Theta, Alpha = Slow**
  - **SMR, Beta, High Beta = Fast**
  - **Gamma = "binding" frequency**

AMPLITUDE

- The power of the electrical impulse, measured in microvolts. (μV)
- Like ***volume*** is to *sound*
- Slower waves have higher amplitudes.
- It takes the brain a lot of energy to produce the faster waves, so amplitudes tend to be lower.

FREQUENCY BANDWITHS

- Single frequencies organized into discreet groups – delta, theta, alpha, etc.
- Each bandwidth is associated with specific characteristics.

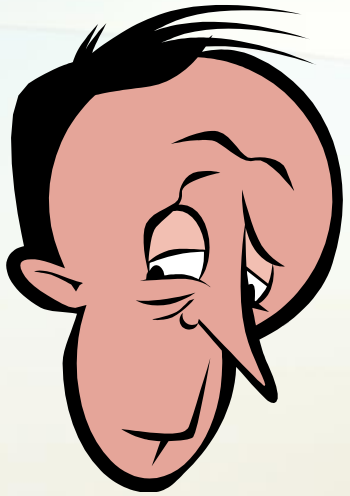
Just as white light can get divided into colors by a prism or for a rainbow, an EEG can be divided into separate frequencies

DELTA δ

- 0.5-3 Hz (cycles or waves per second)
- Sleep State
- Regenerative State
- Complex problem solving
- Consciousness completely internalized
- Transcendental states
- Dominant wave form in infants up to 6 months old
    - **40% of the EEG in infants**
    - **<5% of the EEG in a “normal” adult**

High Amplitudes of Delta

- Learning Disabilities
  - **"Sleepy Brains"**



- Brain Injuries
- Eye Blinks and Eye Movement Artifact
- Possibly dissociation (trauma history)

THETA θ

- 4-7 Hz (cycles or waves per second)
- Trance State
- Intuitive, Creative
- Internal Focus
- Thoughts in theta are visual and/or emotional

High Amplitudes of Theta

- Learning Disabilities
  - Foggy Brains
  - Filtering Problems (ADHD)
  - Processing Problems (ADD)
- Slow Reaction Time
- Lack of Oxygen and Blood Flow
- Depression
- Anxiety

ALPHA α

- 8-12 Hz
- Alertness
- Peacefulness
- Readiness
- Meditation
- Alpha Peak Frequency

High Amplitude *Alpha*

- High Frontal Alpha
  - Daydreamers
  - ADD/ADHD
  - Depression
  - Traumatic Brain Injuries
  - Marijuana Use

SENSORIMOTOR RHYTHM (SMR or lobeta)

- 12-15 Hz
- Relaxed yet focused
- Stillness: Calm Mental State
- Reflecting-before-acting
- Sleep Spindles (12-14 Hz)

BETA β

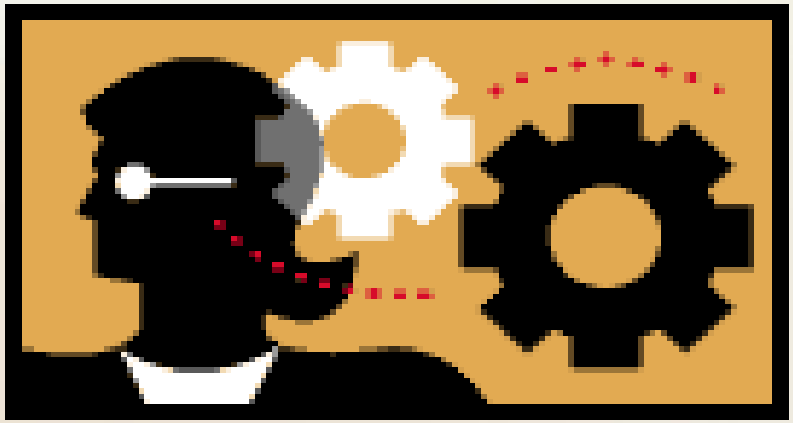
- 15-22 Hz
- Thinking
- Focused
- Sustained Attention
- Problem-Solving
- Externally Oriented

High Amplitude *Beta* *15-22 Hz*

- Left under-activation = Depression
- Right over-activation = Anxiety
- Anxiety Disorders
- Obsessive Compulsive Disorder
- Sleep Disorders
- Bruxism

High Beta

- 23-35 Hz
- Hypervigilance
- Very fast cognitive processing



High Amplitude *High Beta*

- Irritability
- Hypervigilance
- Overthinking
- Ruminations
- Obsessive Compulsive D/O

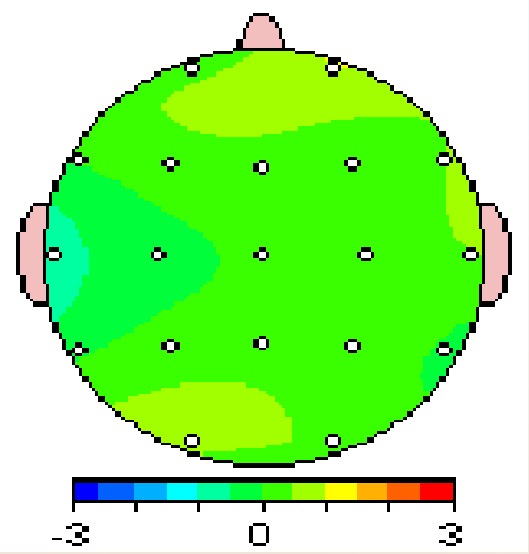
GAMMA γ

- 35-42 Hz (definition varies according to source)
- "The Binding Rhythm"
  - Important to learning by bringing together different aspects of an object into a single precept.
- Associated with transcendent experiences
- Found throughout the scalp rather than one discreet location

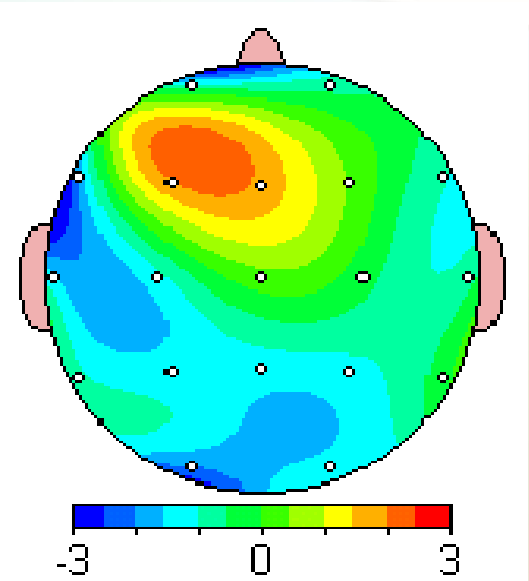
DEPRESSION

Patterns of Slow Alpha (8-10 hz)

NORMAL

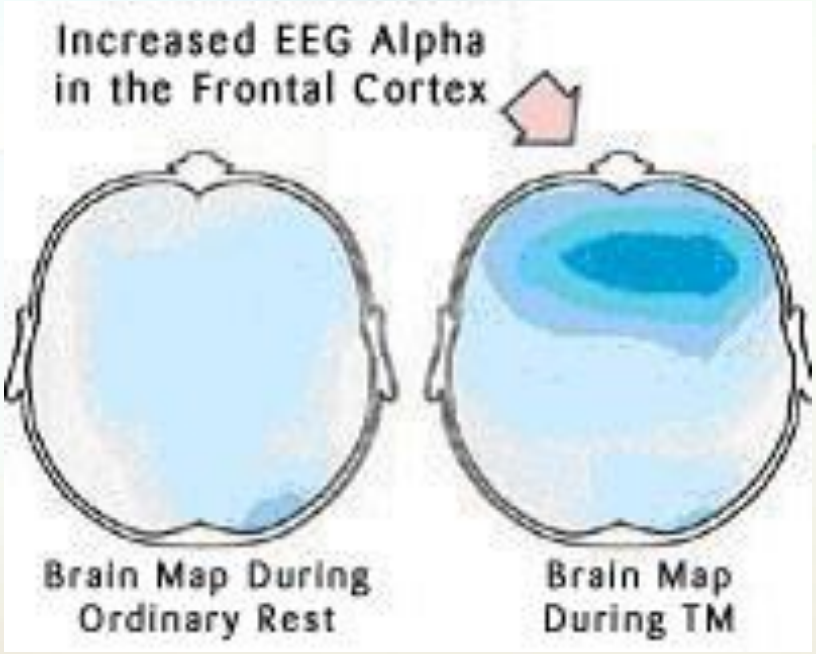


DEPRESSION

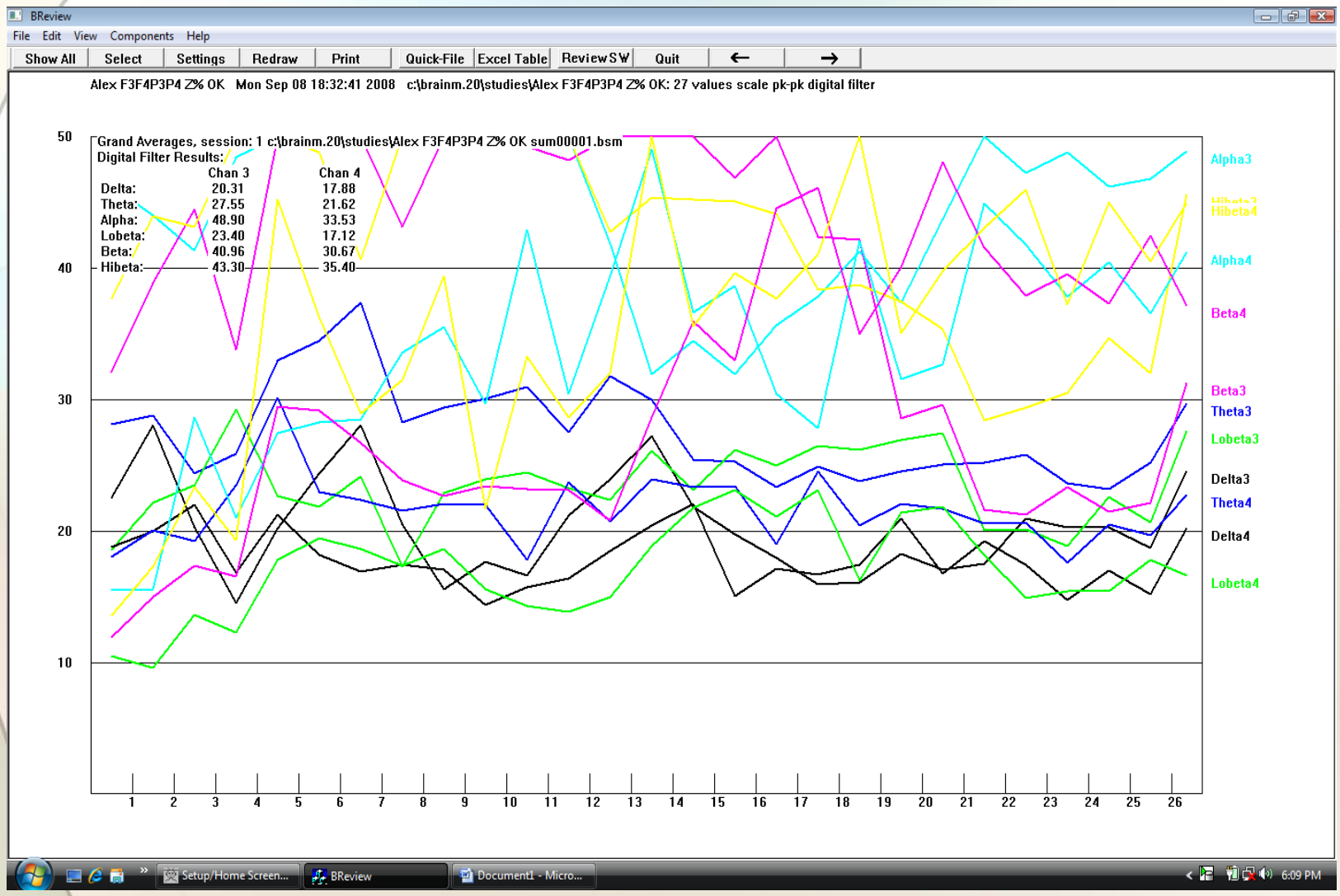


From Cory Hammond, Ph.D., www.isnr.org

Meditation & Alpha

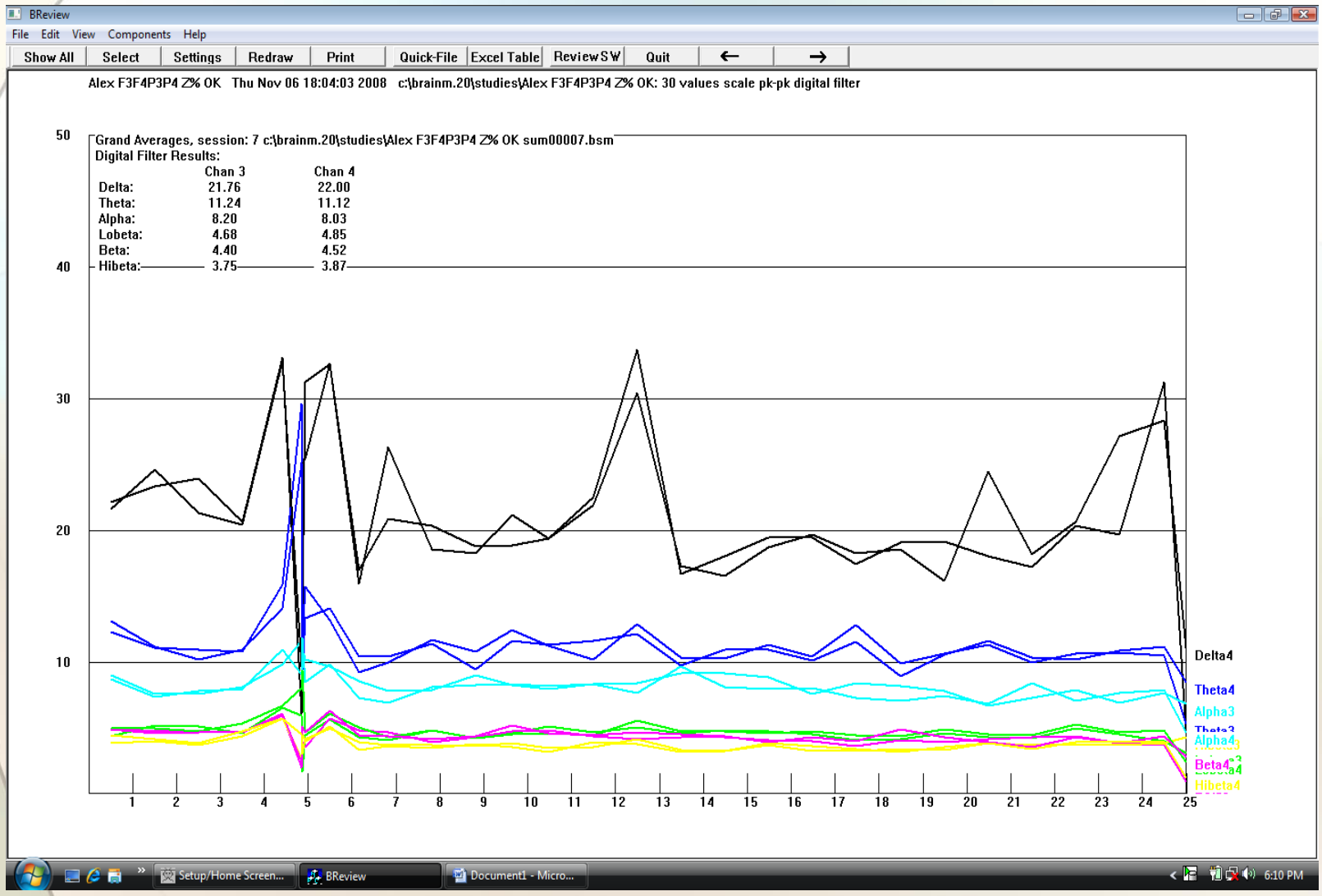


Alex's Parietal Lobes - #1



Alex's Parietal Lobes - #7

(z-score training)



Attention Deficit Disorder

The brain produces fast beta waves when the person is actively mentally involved in a language-based task …

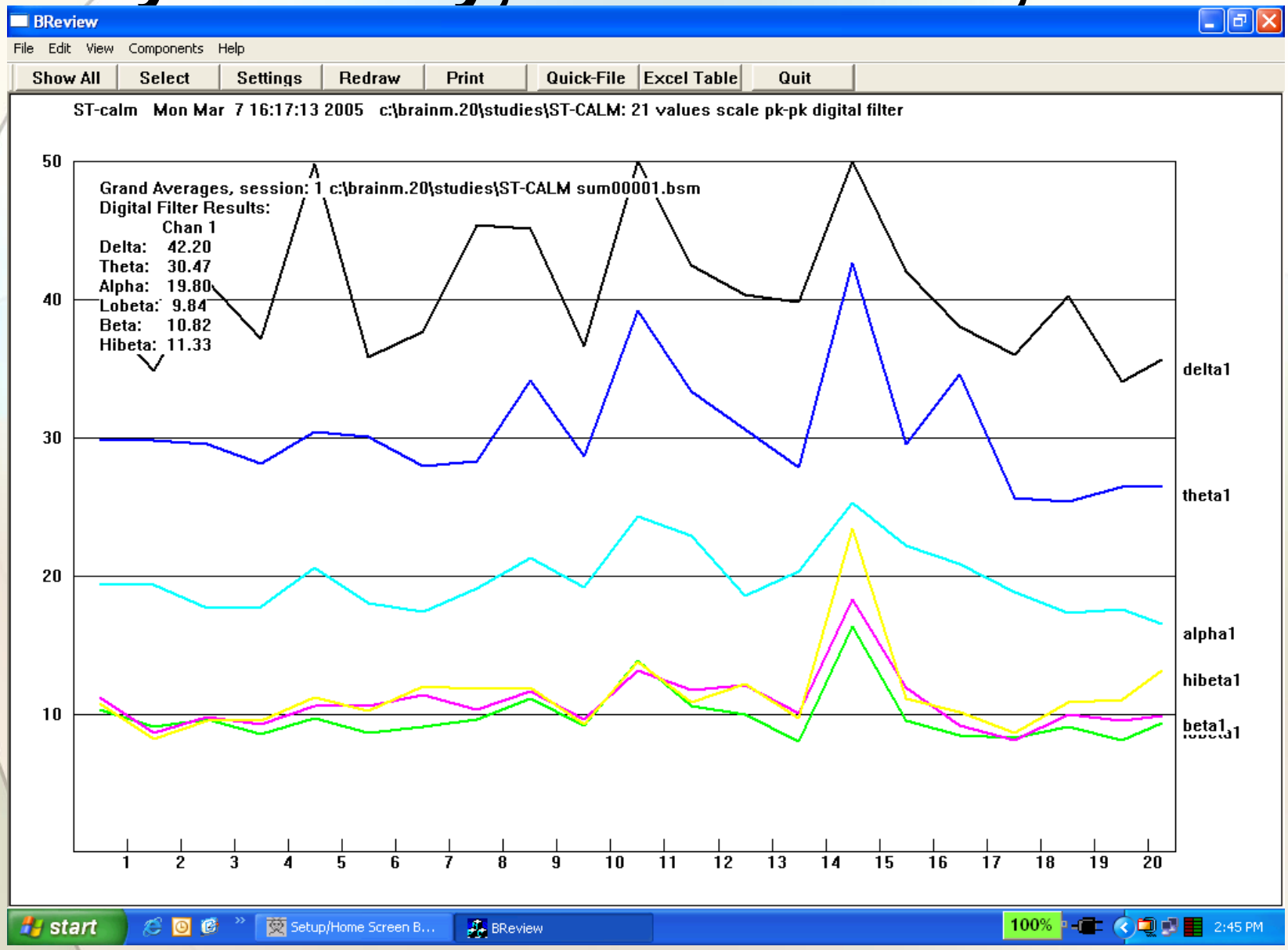
…and slower theta waves when involved in an image-based processing task, like a video game.

For under-powered brains a fast-wave task like school work ends up causing the brain to start into beta…

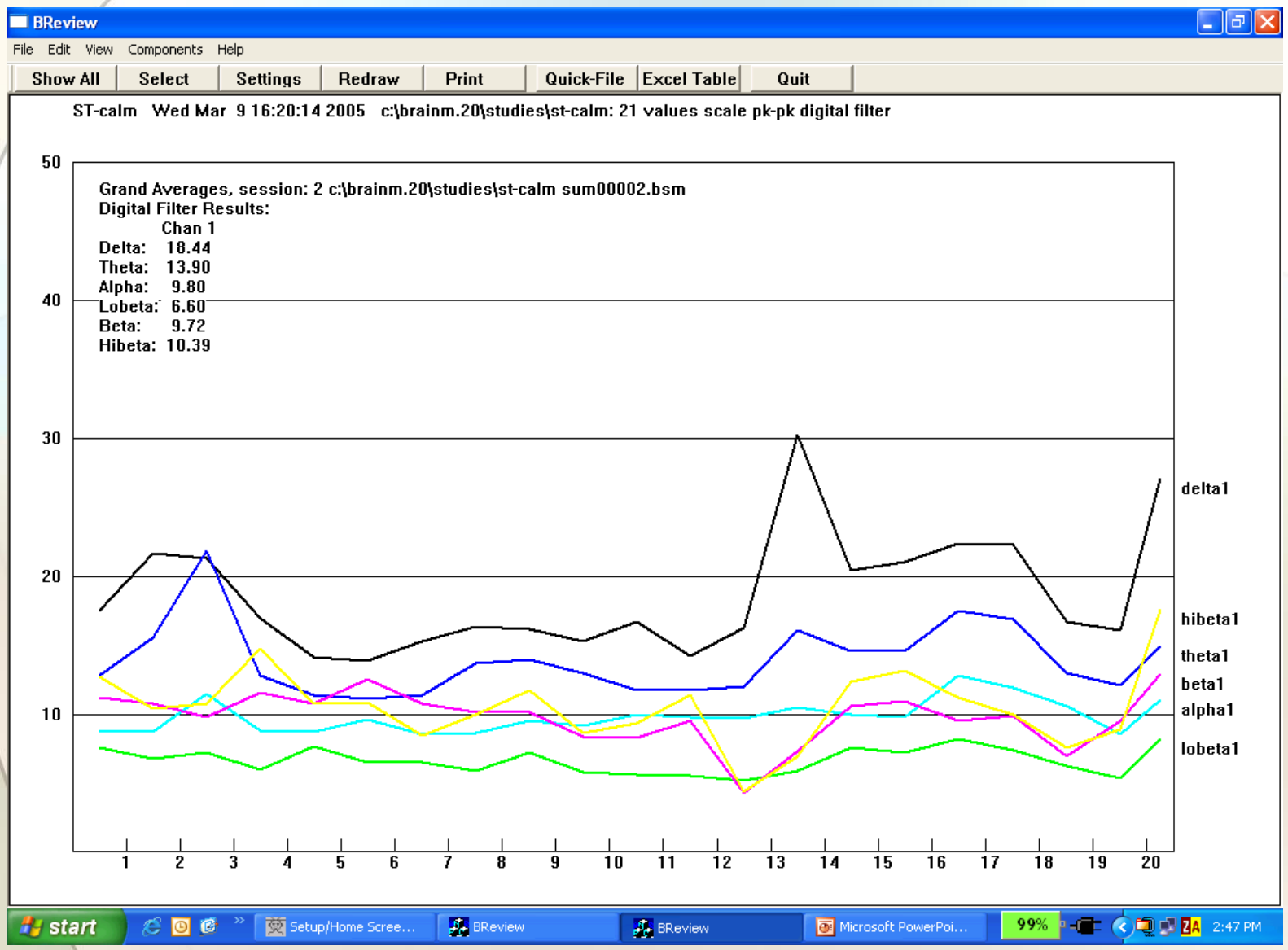
— then collapse into slow drowsy waves.

Stimulant meds can stimulate the brain-- <u>until the meds wear off.</u>

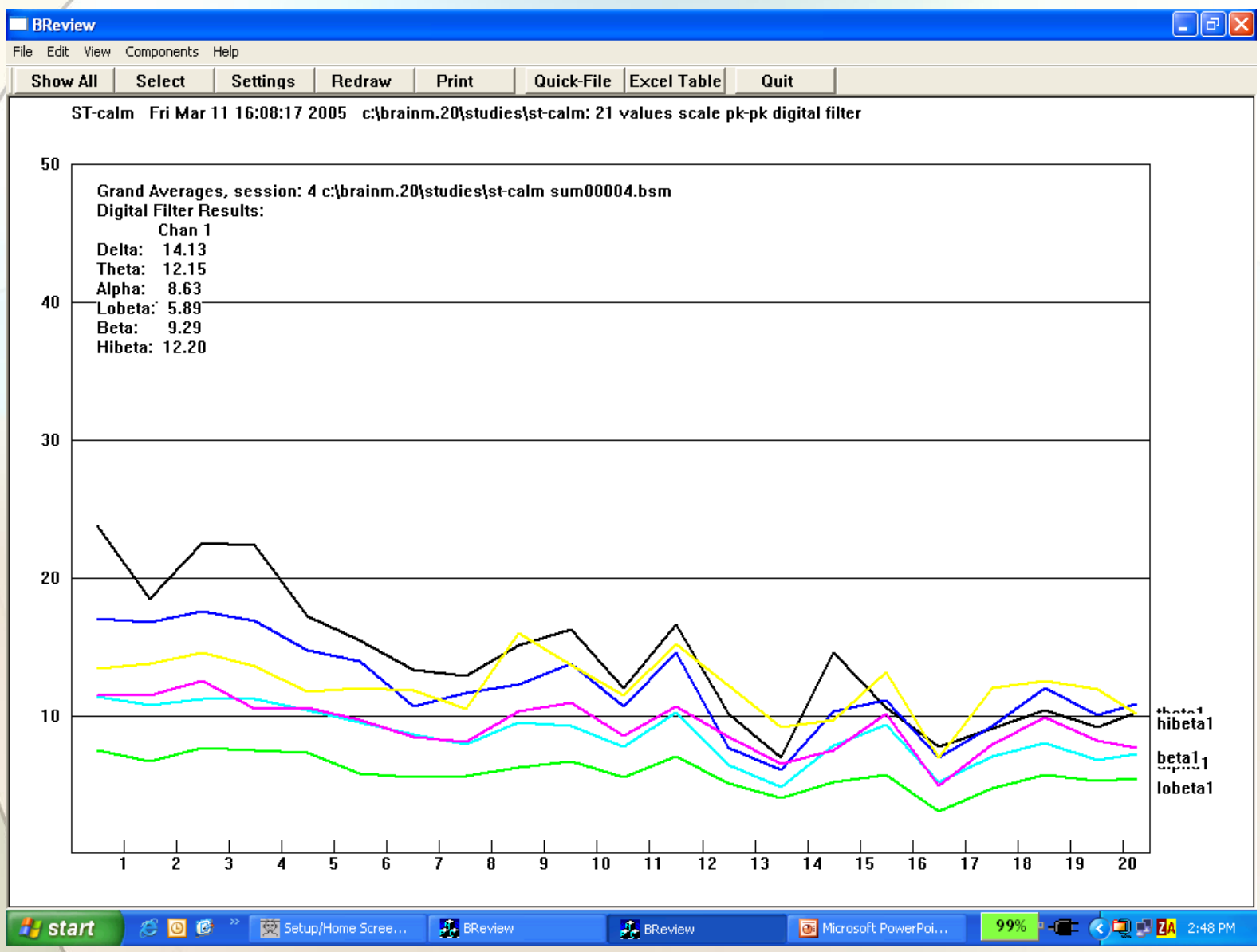
8 yr old boy, severe ADHD, tics



Session #2


BReview
File Edit View Components Help
Show All Select Settings Redraw Print Quick-File Excel Table Quit
ST-calm Wed Mar 9 16:20:14 2005 c:\brainm.20\studies\st-calm: 21 values scale pk-pk digital filter
Grand Averages, session: 2 c:\brainm.20\studies\st-calm sum00002.bsm
Digital Filter Results:
Chan 1
Delta: 18.44
Theta: 13.90
Alpha: 9.80
Lobeta: 6.60
Beta: 9.72
Hibeta: 10.39
50
40
30
20
10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
delta1
hibeta1
theta1
beta1
alpha1
lobeta1
start
Setup/Home Scree...
BReview
BReview
Microsoft PowerPoi...
99%
2:47 PM

Session #4


BReview
File Edit View Components Help
Show All Select Settings Redraw Print Quick-File Excel Table Quit
ST-calm Fri Mar 11 16:08:17 2005 c:\brainm.20\studies\st-calm: 21 values scale pk-pk digital filter
Grand Averages, session: 4 c:\brainm.20\studies\st-calm sum00004.bsm
Digital Filter Results:
Chan 1
Delta: 14.13
Theta: 12.15
Alpha: 8.63
Lobeta: 5.89
Beta: 9.29
Hibeta: 12.20
50
40
30
20
10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
hibeta1
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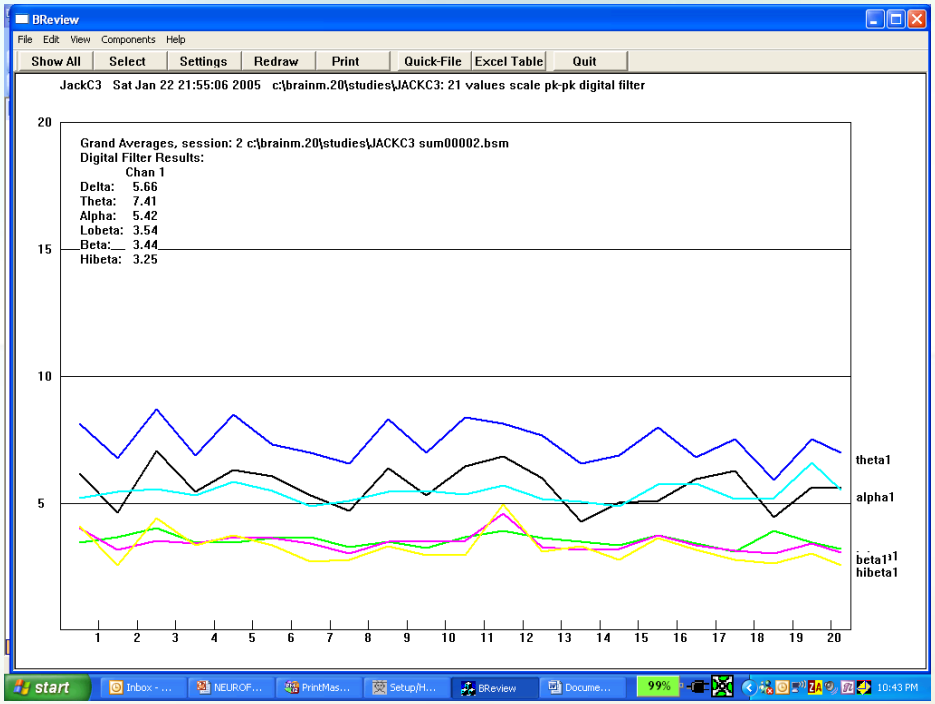
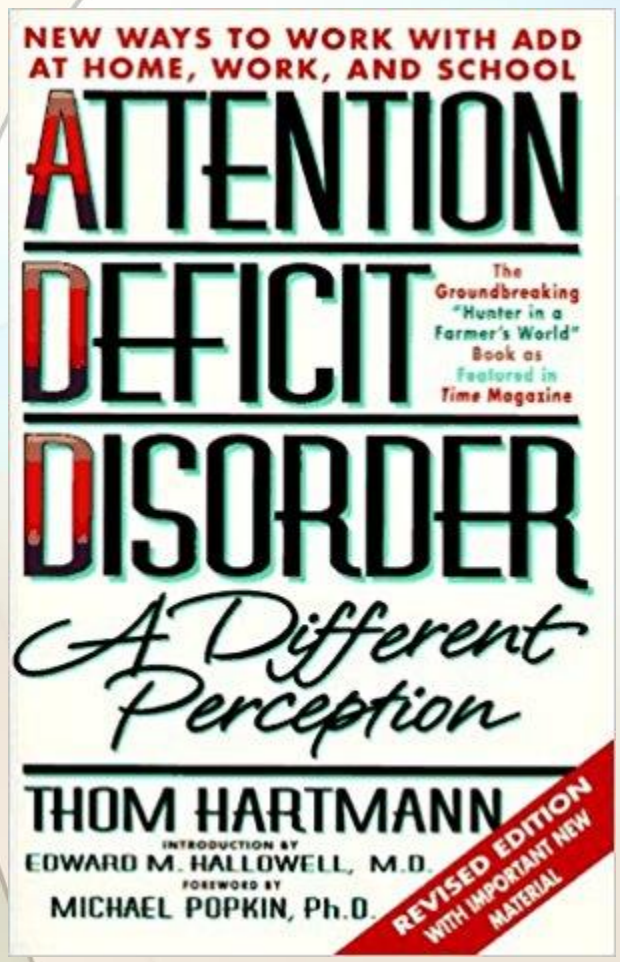
lobeta1
start
Setup/Home Scree...
BReview
BReview
Microsoft PowerPoi...
99%
2:48 PM



NF works by re-training the brain to produce the beta waves on its own – and many people continue to improve after the training ends!



However, is ADHD a **disability** – or just a **different kind of normal**? (Or both?)

All attention problems are not ADHD!

Other possible causes:

-Stress
-Trauma
-Attachment disruption
-Anxiety
-OCD
-Depression
-Learning disabilities
-Poor sleep
-Poor diet
-Lack of exercise
-Substance abuse

ACE Study
Adverse Childhood Experiences

- Kaiser Permanente & CDC
- Original study 1995-1997 in southern CA
- Over 17,000 participants = one of the largest studies ever of long term effects of childhood abuse & neglect

ACE study asked about…

1. Emotional abuse
2. Physical abuse
3. Sexual abuse
4. Violence in home
5. Substance abuse in home
6. Serious mental illness in household
7. Parental separation/divorce
8. Household member in prison
9. Emotional neglect
10. Physical neglect

Results?

33%	51%	16%
no ACEs	1-3 ACEs	4-10 ACEs

SMOKING

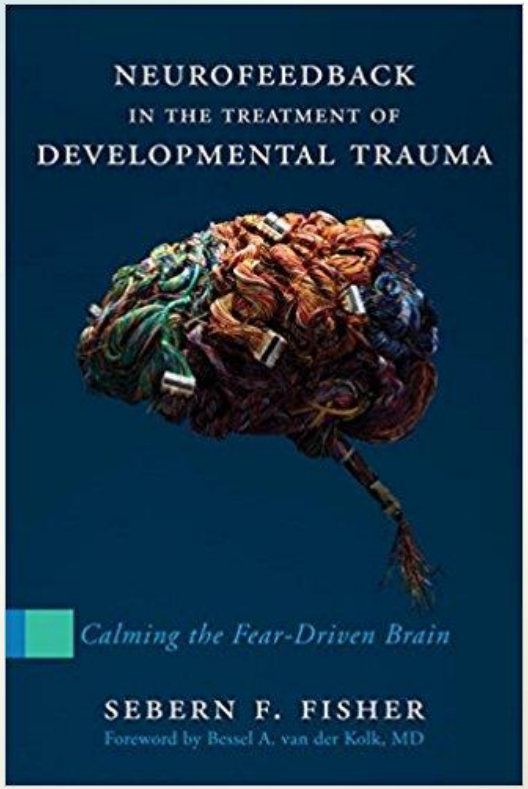
1 in 16	1 in 9	1 in 6

IV DRUG USE

1 in 480	1 in 43	1 in 30

33%	51%	16%
no ACEs	1-3 ACEs	4-10 ACEs
ALCOHOLISM		
1 in 69	1 in 9	1 in 6
HEART DISEASE		
1 in 14	1 in 7	1 in 6
SUICIDE ATTEMPTS		
1 in 96	1 in 10	1 in 5

Early childhood trauma is never as predictive of treatment failure as the absence of a mother [physically and/or emotionally].



We learn affect regulation early in life (= right hemisphere development)

Depends on maternal attunement to the affective needs of the baby

Lack of synchronicity → abnormal rhythms of brain, mind and body.

(Bessel van der Kolk, MD)

The core trauma may not be assaults (however terrible) but the absence of the mother, physically or emotionally, to prevent, address, or repair it. (Sebern Fisher)

FEAR is the pre-eminent emotion in all psychopathology, and has the potential to highjack all other states of mind.

Sebern Fisher

The child who feels **motherless & uncontained** lives in a central nervous system **frozen in fear**…

"Without the felt experience of the self-regulated mother, the baby is so overtaken by fear for her survival (and perhaps for mother's too) that she has no capacity to organize a felt, coherent sense of self and other." (Allan Schore)

The good enough mother figure

- Protects child from effects of severe trauma.
- **Validates the child's experience** and **helps child recover and develop resiliency**.
- Makes the difference between **experiencing a traumatic event** and **becoming traumatized**.
-

Why therapy alone is unlikely to work…

Effective therapy requires:

- Relationship with therapist that matters
- A sense of self and of others
- Some level of affect regulation

Likely to be missing in developmental trauma

Why neurofeedback can make a difference

- **Helps develop affect regulation** – essentially **"rewiring" the brain**, especially the right hemisphere

- ***Affect regulation*** makes it possible to develop a **sense of self**

Changing Brain Rhythms

The brain's **ability to learn and change** lies primarily in its electrical properties – **how it fires.**

The brain organizes itself rhythmically in brainwave frequencies…this is where brain plasticity resides.

We can access those rhythms through NFB!

Deep States Training

(trauma/substance abuse)

Alpha-Theta Protocol

- Uses combination of water sounds (babbling brook & ocean surf) to reflect dominant alpha or theta
- Informational training (rather than operant conditioning) – not trying to do anything

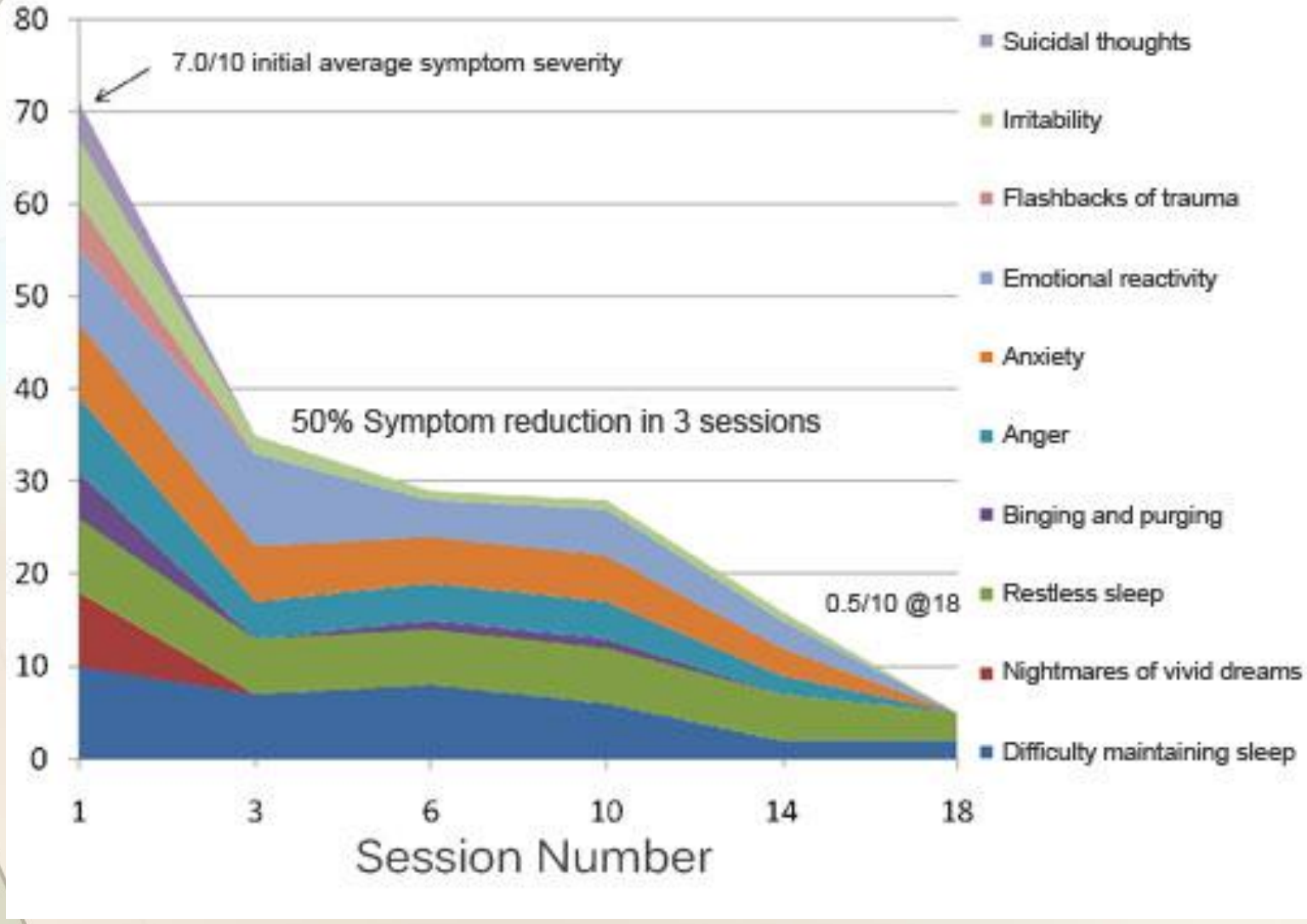
Lulls the brain down to 7 hz (theta), where visualizations & memory recall may occur – but without triggering the brain's alarm system

Trauma can get reprocessed without the emotional content.

(described as witnessing rather than re-experiencing)

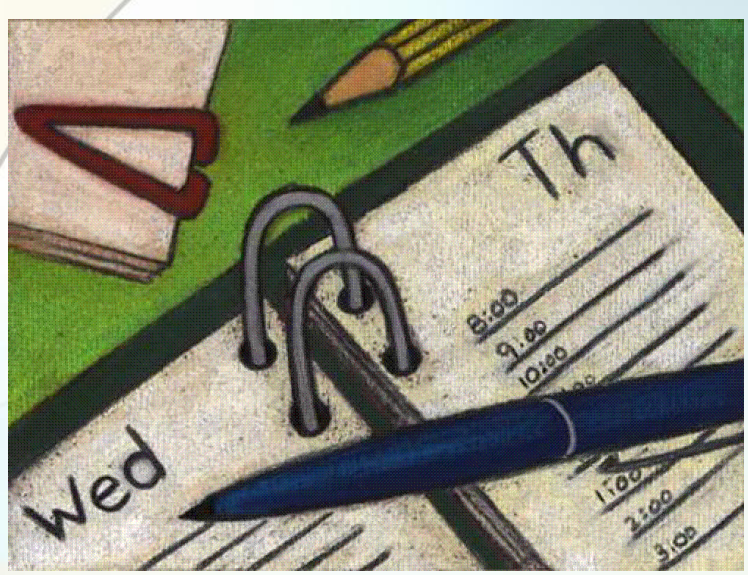
Also useful for guided imagery – powerful way to image how one wants to be in particular situations in future

Symptom Severity Trend over first 18 Sessions



Non-clinical applications of NFB include…

- Creativity
- Insight
- Performance
- Heightened awareness

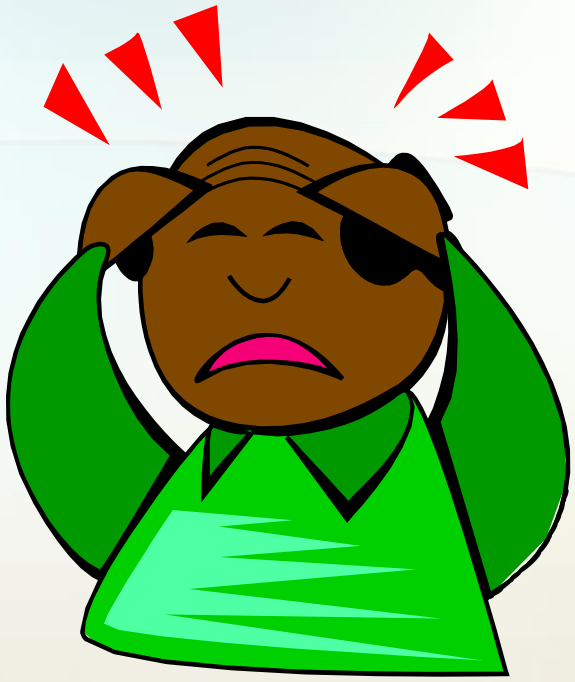


How long is the treatment?

Typical training is

2-3 times a week, for 30-60 minutes.

Usually the effects are gradual,



although they can sometimes be more immediate.

For many conditions,

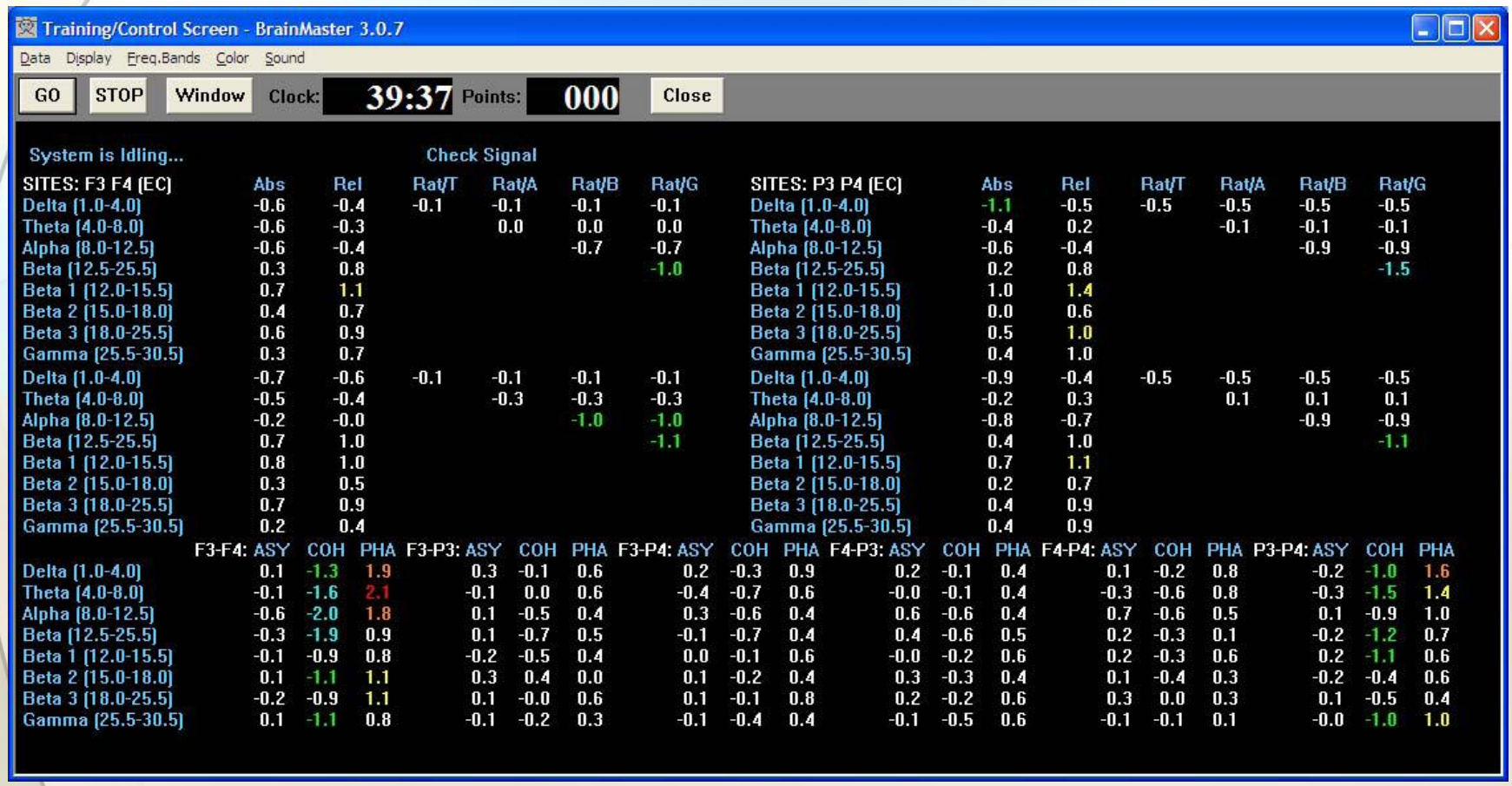
20-40 sessions

will provide nearly permanent relief.

Z-Score Training

- Focuses on reducing variances from the norm (standard deviations)
- Special software assesses the current brainwave activity, compares the data to a normative data base, & develops the appropriate training protocol.

Live Z Scores –4 channels (248 targets)



Training/Control Screen - BrainMaster 3.0.7

Data Display Freq.Bands Color Sound

GO STOP Window Clock: 39:37 Points: 000 Close

System is Idling... Check Signal

SITES: F3 F4 (EC)	Abs	Rel	Rat/T	Rat/A	Rat/B	Rat/G
Delta (1.0-4.0)	-0.6	-0.4	-0.1	-0.1	-0.1	-0.1
Theta (4.0-8.0)	-0.6	-0.3		0.0	0.0	0.0
Alpha (8.0-12.5)	-0.6	-0.4			-0.7	-0.7
Beta (12.5-25.5)	0.3	0.8				-1.0
Beta 1 (12.0-15.5)	0.7	1.1				
Beta 2 (15.0-18.0)	0.4	0.7				
Beta 3 (18.0-25.5)	0.6	0.9				
Gamma (25.5-30.5)	0.3	0.7				
Delta (1.0-4.0)	-0.7	-0.6	-0.1	-0.1	-0.1	-0.1
Theta (4.0-8.0)	-0.5	-0.4		-0.3	-0.3	-0.3
Alpha (8.0-12.5)	-0.2	-0.0			-1.0	-1.0
Beta (12.5-25.5)	0.7	1.0				-1.1
Beta 1 (12.0-15.5)	0.8	1.0				
Beta 2 (15.0-18.0)	0.3	0.5				
Beta 3 (18.0-25.5)	0.7	0.9				
Gamma (25.5-30.5)	0.2	0.4				

SITES: P3 P4 (EC)	Abs	Rel	Rat/T	Rat/A	Rat/B	Rat/G
Delta (1.0-4.0)	-1.1	-0.5	-0.5	-0.5	-0.5	-0.5
Theta (4.0-8.0)	-0.4	0.2		-0.1	-0.1	-0.1
Alpha (8.0-12.5)	-0.6	-0.4			-0.9	-0.9
Beta (12.5-25.5)	0.2	0.8				-1.5
Beta 1 (12.0-15.5)	1.0	1.4				
Beta 2 (15.0-18.0)	0.0	0.6				
Beta 3 (18.0-25.5)	0.5	1.0				
Gamma (25.5-30.5)	0.4	1.0				
Delta (1.0-4.0)	-0.9	-0.4	-0.5	-0.5	-0.5	-0.5
Theta (4.0-8.0)	-0.2	0.3		0.1	0.1	0.1
Alpha (8.0-12.5)	-0.8	-0.7			-0.9	-0.9
Beta (12.5-25.5)	0.4	1.0				-1.1
Beta 1 (12.0-15.5)	0.7	1.1				
Beta 2 (15.0-18.0)	0.2	0.7				
Beta 3 (18.0-25.5)	0.4	0.9				
Gamma (25.5-30.5)	0.4	0.9				

	F3-F4: ASY	COH	PHA	F3-P3: ASY	COH	PHA	F3-P4: ASY	COH	PHA	F4-P3: ASY	COH	PHA	F4-P4: ASY	COH	PHA	P3-P4: ASY	COH	PHA
Delta (1.0-4.0)	0.1	-1.3	1.9	0.3	-0.1	0.6	0.2	-0.3	0.9	0.2	-0.1	0.4	0.1	-0.2	0.8	-0.2	-1.0	1.6
Theta (4.0-8.0)	-0.1	-1.6	2.1	-0.1	0.0	0.6	-0.4	-0.7	0.6	-0.0	-0.1	0.4	-0.3	-0.6	0.8	-0.3	-1.5	1.4
Alpha (8.0-12.5)	-0.6	-2.0	1.8	0.1	-0.5	0.4	0.3	-0.6	0.4	0.6	-0.6	0.4	0.7	-0.6	0.5	0.1	-0.9	1.0
Beta (12.5-25.5)	-0.3	-1.9	0.9	0.1	-0.7	0.5	-0.1	-0.7	0.4	0.4	-0.6	0.5	0.2	-0.3	0.1	-0.2	-1.2	0.7
Beta 1 (12.0-15.5)	-0.1	-0.9	0.8	-0.2	-0.5	0.4	0.0	-0.1	0.6	-0.0	-0.2	0.6	0.2	-0.3	0.6	0.2	-1.1	0.6
Beta 2 (15.0-18.0)	0.1	-1.1	1.1	0.3	0.4	0.0	0.1	-0.2	0.4	0.3	-0.3	0.4	0.1	-0.4	0.3	-0.2	-0.4	0.6
Beta 3 (18.0-25.5)	-0.2	-0.9	1.1	0.1	-0.0	0.6	0.1	-0.1	0.8	0.2	-0.2	0.6	0.3	0.0	0.3	0.1	-0.5	0.4
Gamma (25.5-30.5)	0.1	-1.1	0.8	-0.1	-0.2	0.3	-0.1	-0.4	0.4	-0.1	-0.5	0.6	-0.1	-0.1	0.1	-0.0	-1.0	1.0

26 x 4 + 24 x 6 = 248 (104 power, 144 connectivity)

For traditional therapy, NFB can make people "more available" and therapy-ready by quieting (or energizing or stabilizing) their brains.

What are the costs?

1. Training
2. Equipment

TRAINING: What does it take to get certified in neurofeedback?

REQUIREMENTS

1. BCIA blueprint workshop (36 hrs)
2. Practical experience (100 sessions + 10 on self)
3. 25 hrs of mentoring
4. Neuroanatomy/neuropsychology
5. Professional license/credential
6. Written exam

BCIA Training Blueprint

1. Orientation – 4 hrs
2. Basic Neurophysiology & Neuroanatomy – 4 hrs
3. Instrumentation & Electronics – 4 hrs
4. Research Evidence Base for Neurofeedback – 2 hrs
5. Psychopharmacological Considerations – 2 hrs
6. Patient/Client Assessment – 4 hrs
7. Developing Treatment Protocols – 6 hrs
8. Treatment Implementation – 6 hrs
9. Current Trends in Neurofeedback – 2 hrs
10. Ethical & Professional Conduct – 2 hrs

TOTAL 36 hours

Where to get training?

- Must be a BCIA-accredited training
- Stress Therapy Solutions (*www.stresstherapysolutions.com*) ~$1240
- Various equipment manufacturers – BCIA website has a list (about the same $)
- Online training – John Demos & others (~ $1050)
- Purchase training packages (~$750)

EQUIPMENT*

- Amplifier & cables
- Software
- Sensors
- Supplies (NuPrep, EEG paste)

*lease-purchase plans available

4-channel Atlantis (can also get a 2-channel amplifier)

What's Included in This $3300 Package?

- 4-channel Atlantis amplifier& cables, carrying case
- Set of 18" Electrodes (5 electrodes per pack) + earclips
- NuPrep Gel & 10/20 Paste
- BrainAvatar 4.0 software
- MultiMedia Player Package (MMP) *[needed for alpha-theta training]*
- 15-month warranty
- Complimentary 1 year Affiliate Membership
- **Z-score software is an add-on – about $1000**

19 channel Discovery amplifier

About $5,000
with impedance lid
(recommended)
PLUS software)

- Can do QEEGs (brain maps)
- Can train many areas at once!

PLUS a good computer (desktop or gaming laptop)

Why should you consider learning neurofeedback?

1. Better client outcomes – and probably much more quickly

2. Many clients seeking non-Rx alternatives (we are an over-medicated society)

3. Empowering client experience – client does the work!

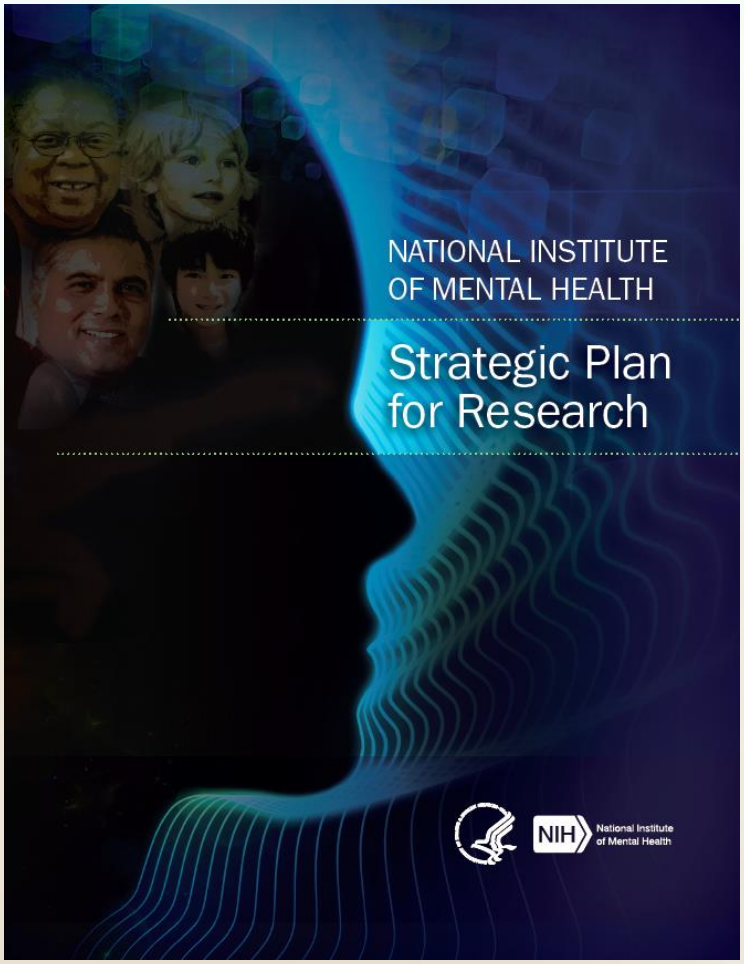
4. Good for therapy-resistant clients

5. Can treat co-occurring disorders concurrently

6. It makes sense!

"Neurons that fire together wire together" = habit

NIMH has a growing interest in neuroscience and biomarkers for mental illness in the brain



Science News About the BRAIN Initiative

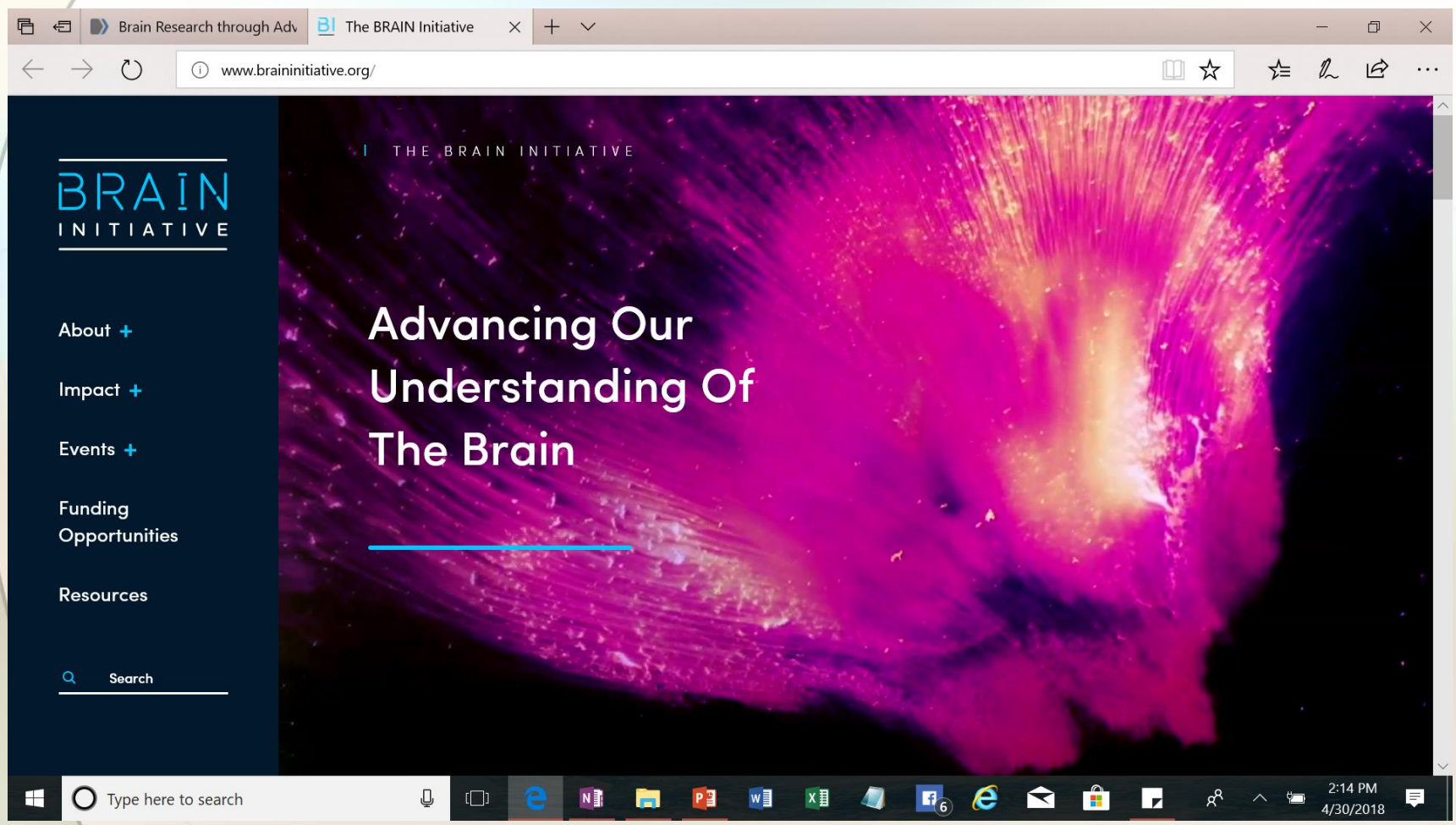
NIH Nearly Doubles Investment in BRAIN Initiative Research (2016)

NIH's third round of grants to support the goals of the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative total just over $150 million.

www.isnr.org : International Society for Neurofeedback & Research. Comprehensive bibliography of neurofeedback research organized by disorder. Journal articles, provider list and other information.

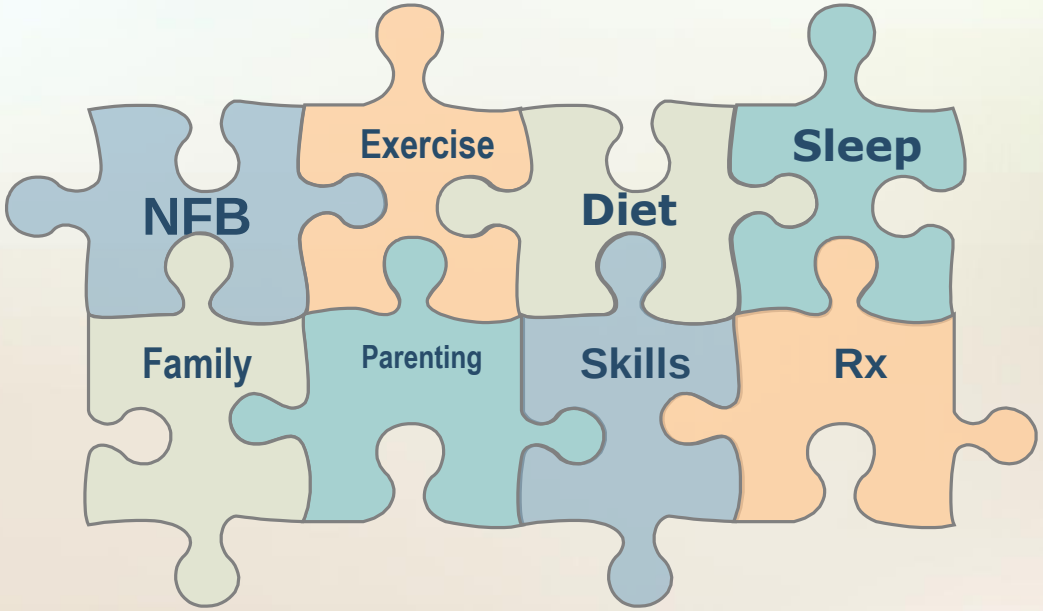
www.aapb.org: Association for Applied Psychophysiology & Biofeedback. International biofeedback organization. Home of BCIA (Biofeedback Certification International Alliance).

https://braininitiative.nih.gov/index.htm



For best results…

Include neurofeedback as part of a comprehensive approach



We can’t choose our heads, but we can change our brains!

THE END

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