HBOT Update and Various Protocols Used for ASD

Autism One Conference
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What Parents Want To Know

- Are there research studies that support the use of HBOT for children with autism?
- Is HBOT covered by insurance and is funding available?
- Who benefits from HBOT?
- What needs to be in place before starting HBOT for it to work most effectively?
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Hyperbaric Therapy: History

- 320 BC: Alexander the Great used a chamber that was submersed under water.

Hyperbaric Therapy: History

- 1775: Joseph Priestley; English amateur chemist; oxygen discovered independently from Karl W. Scheele; both Scheele and Priestley are given credit for its discovery.

Hyperbaric Therapy: History

- 1783: Caillens; French physician was the first doctor reported to use oxygen therapy as a remedy.

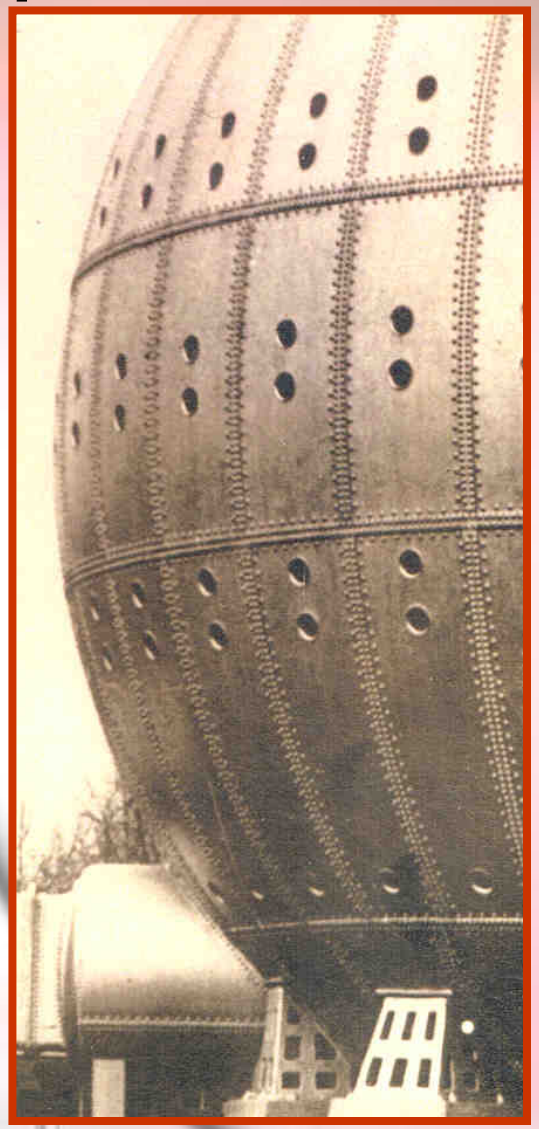
Hyperbaric Therapy: History

- 1878: P. Bert; published Barometric Pressure describing caisson's disease, and the bubble theory of decompression sickness (DCS) and oxygen toxicity.

Hyperbaric Therapy: History

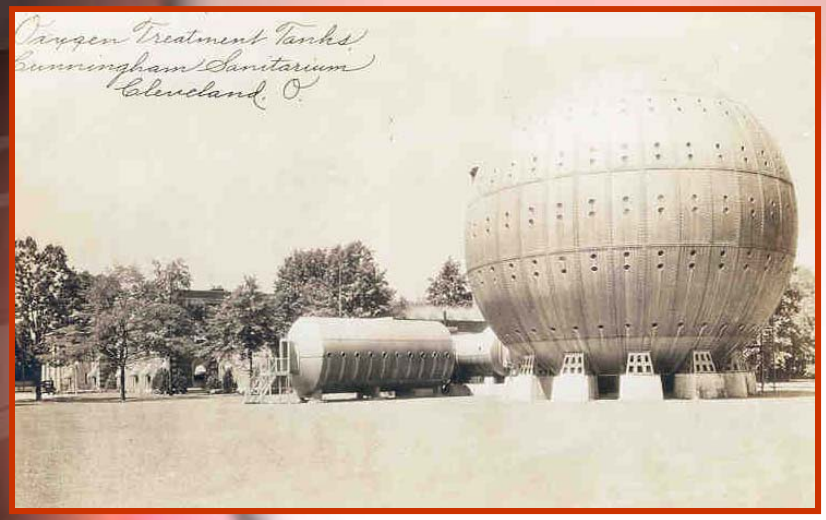
- 1921: Cunningham from Kansas City, Missouri; 10 ft by 88 ft. chamber used air to treat hypoxic states; later used to treat hypertension, syphilis, cancer, and diabetes mellitus; this resulted in a challenge by the AMA in the 1930s.

Hyperbaric Therapy: History



- 1928 - Cleveland Ohio
- Cunningham's giant steel ball hyperbaric hotel
- Six stories high
- Contained 72 rooms
- Failed due to the 1929 stock market crash

Hyperbaric Therapy: History



Hyperbaric Therapy: History

- 1960: Boerema; published Life Without Blood; described oxygen transport in plasma of pigs without red cells; considered the father of modern hyperbaric medicine.

Hyperbaric Therapy: History

-2011-

Multiplace Chambers

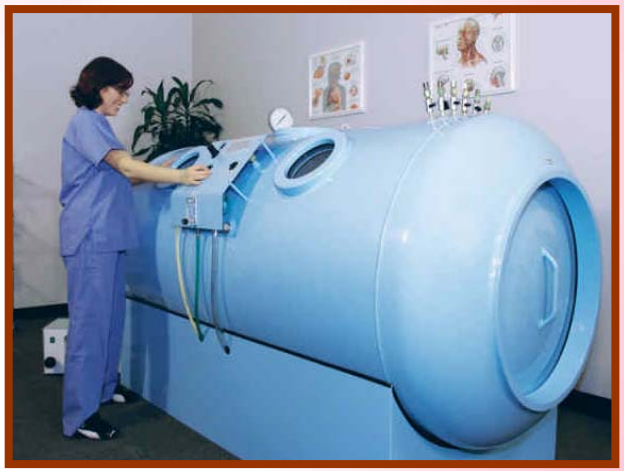
Monoplace Chambers

Require much higher standards be followed for safety reasons

Hyperbaric Therapy: History

-2011-

Fortius 420



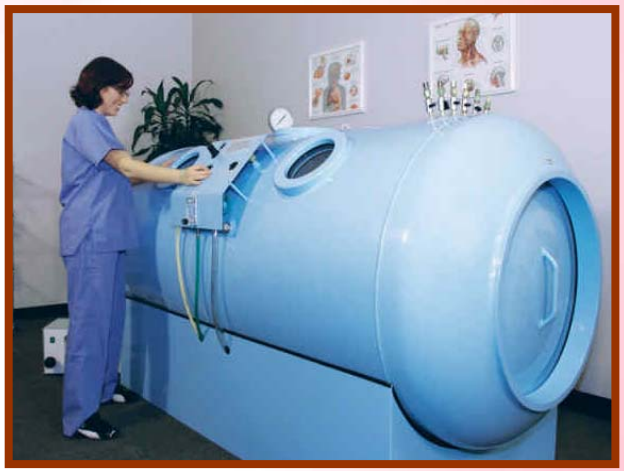
Vitaeris 320

“The Baby Blue”

Hyperbaric Therapy: History

-2011-

Fortius 420

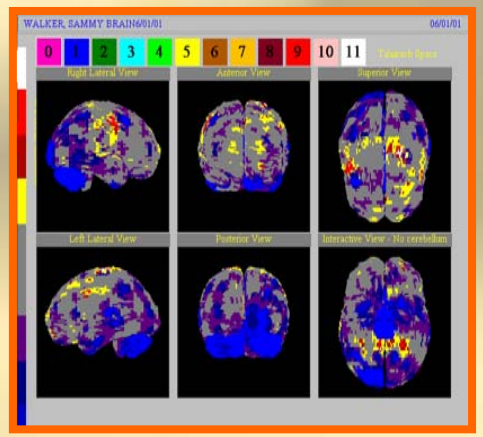


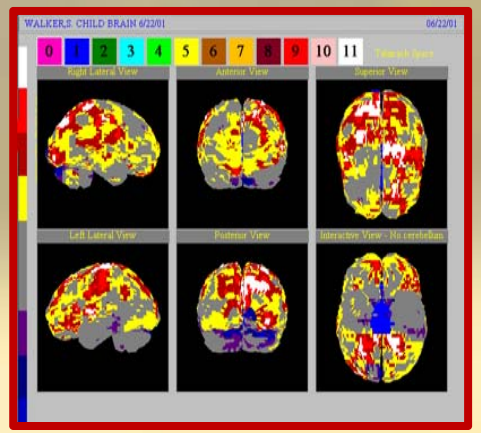
Vitaeris 320

Because of their special designs, a much greater safety factor has been automatically built into their use.

Hyperbaric Therapy: History

- 2002: Heuser published the results of his study showing SPECT scan results on a 4 year old child with autism.





Before and After HBOT

Hyperbaric Therapy: History

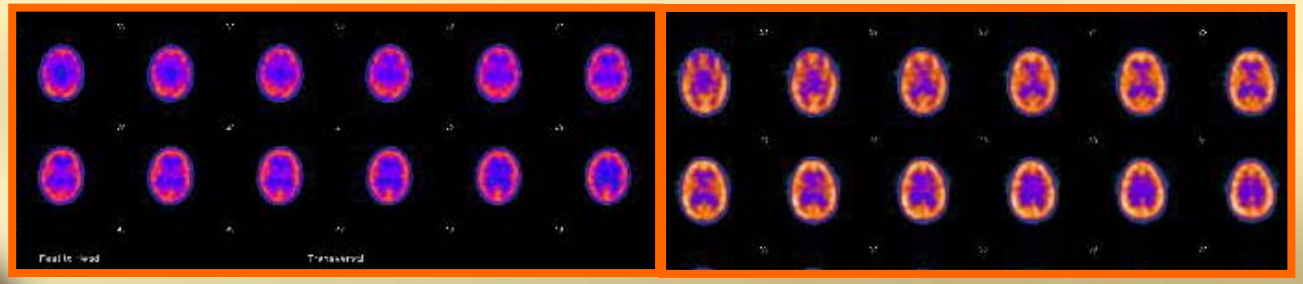
- 2005: Stoller documented neurocognitive changes before, during, and after hyperbaric oxygen therapy in a case of *longstanding* fetal alcohol syndrome of *sixteen years.*

Hyperbaric Therapy: History

- 2005: Stoller's study adds credence to Neubauer's *(this is not Neubrander)* "idling neuron theory". This theory states that "post event" (many different types) there is a zone in which oxygen levels are not high enough for neurons to function. Once oxygen is supplied to such neurons in sufficient amounts, they have the capacity to be revitalized and function normally.

Hyperbaric Therapy: History

- 2005: Buckley and Kartzinel, in an unpublished study, describe SPECT scan results and positive clinical findings documenting HBOT as an effective treatment modality to use for children with autism.



Hyperbaric Therapy: History

- 2006-2009: Rossignol is the first to describe the possibility that hyperbaric oxygen therapy may improve symptoms in autistic children.

Hyperbaric Therapy: History

- 2006-2009: He then completed a pilot study showing the effects of hyperbaric oxygen therapy on oxidative stress, inflammation, and symptoms in children with autism.

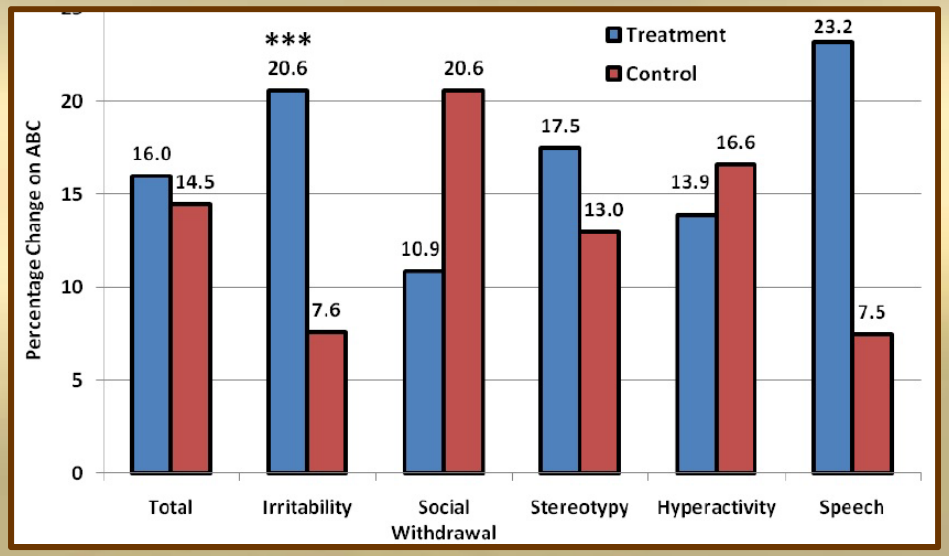
Hyperbaric Therapy: History

- 2006-2009: Next he published a study describing how hyperbaric oxygen therapy might improve certain pathophysiological findings in autism.

Hyperbaric Therapy: History

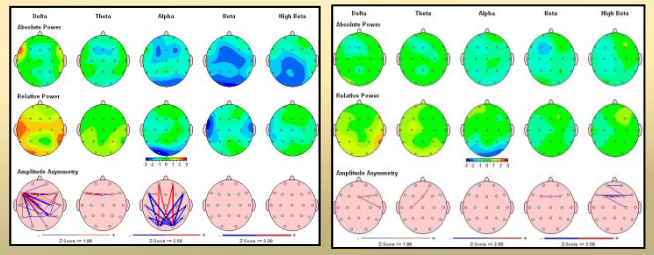
- 2006-2009: He is responsible for publishing the first double-blind placebo-controlled study demonstrating that low pressure, low oxygen concentrations improve symptoms in children with autism.

Rossignol, DA, et. al., Hyperbaric treatment for children with autism BMC Pediatrics 2009 Mar 13; 9:21



Hyperbaric Therapy: History

- 2009: Neubrander is the first to use QEEG data to document the effects of low pressure, low oxygen concentration for extended treatment times given twice daily for 30 consecutive days followed by a mandatory 3 week break.



Before and After HBOT

Hyperbaric Therapy: History

- 2010: Jepson and Granpeesheh publish their study that states low pressure, low oxygen concentration hyperbaric treatments had no statistically detectable clinical benefits for children with autism.

Hyperbaric Therapy: History

- 2010: Granpeesheh and Bradstreet's study (in press) concluded that low pressure, low oxygen concentration hyperbaric treatments had no clinical effect and challenged the Rossignol study conclusions. Bradstreet later retracted his position; Granpeesheh did not.

Hyperbaric Therapy: History

- 2011 Neubrander has now evaluated over 800 children on the autism spectrum using both low pressure portable units and standard high pressure 100% oxygen units. He has followed upwards of 100,000 hyperbaric oxygen treatment hours since December 2005.

Hyperbaric Therapy: History

- 2011 His clinical results challenge the Granpeesheh, Jepson, Bradstreet conclusions that state there is no statistical benefit from HBOT in portable chambers. Neubrander maintains that the difference between observing positive effects vs. minimal to no effects is dependent upon the protocol used to treat the children.

Hyperbaric Therapy: History

- 2011 Funding has prevented Neubrander from conducting controlled studies for publication that use his protocols.
- He accepts the scientific community's criticism regarding this issue.
- He will gladly accept cash, checks, credit cards, or money orders from anyone who would like to help him correct this problem~!

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Will My Insurance Company Help Pay For This Expensive Treatment?

- **Insurance company "Rules" require that a doctor be *able to document* his or her diagnosis, that the recommendation for HBOT be *usual and customary,* and that hyperbaric oxygen is *not experimental* for the condition to be treated.**
- **Should a doctor provide a diagnosis that is paid for but later found not to meet these criteria, the doctor could be *severely sanctioned* and the doctor or patient could *be required to return the money* they were paid.**

Approved Indications by Insurance and Medicare

- ***Abscess, intracranial***
- ***Anemia secondary to blood loss that is exceptional and severe***
- ***Burns, thermal***

Approved Indications by Insurance and Medicare

- *Carbon monoxide poisoning*
- *Compartment syndrome*
- *Decompression sickness*
- *Embolism, air or gas*

Approved Indications by Insurance and Medicare

- ***Gangrene, gas (Clostridial myositis and myonecrosis)***
- ***Infections, osteomyelitis, refractory***
- ***Infections, soft tissue necrotizing***
- ***Injuries, crush***

Approved Indications by Insurance and Medicare

- ***Injuries, radiation, delayed (soft tissue and bony necrosis)***
- ***Ischemias of various types when acute and severe***
- ***Wound healing, including skin flaps and grafts that are compromised***

Unapproved Indications
"Off-label" Studied Indications

- ***Cerebral Palsy (Montgomery, 1999)***
- ***Amyotrophic Lateral Sclerosis (Steele, 2004)***
- ***Complex Regional Pain Syndrome (Kiralp, 2004)***
- ***Fetal Alcohol Syndrome (Stoller, 2005)***

Unapproved Indications
"Off-label" Studied Indications

- ***Ischemic Brain Injury (Neubauer, 1992; Neubauer, 1998)***
- ***Traumatic Midbrain Syndrome (Holbach, 1974)***
- ***Closed Head Injury (Rockswold, 1992)***
- ***Lupus (Wallace, 1996)***

Unapproved Indications
"Off-label" Studied Indications

- ***Stroke (Nighoghossian, 1995)***
- ***Myocardial Infarction (Shandling, 1997)***
- ***Migraine and cluster headaches (Wilson, 1998; Yildiz, 2006; di Sabato, 1997)***
- ***Chronic pain (Yildiz, 2006)***
- ***Autism (Chungpaibulpatana, 2008; Rossignol, 2009)***

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"Tricking The System" Dangerous Coding Practices

- **Encephalopathy**
  - **This is just a general statement that is non-specific but one that can be supported:**
    - **Encephal – relating to the brain**
    - **Opathy – relating to an abnormality**
  - **Therefore, this code is not dangerous to use but rarely, if ever, gets covered by insurance**
- **Cerebral edema (may get coverage but is extremely dangerous without documentation)**
- **Neuroinflammation (may get coverage but is extremely dangerous without documentation)**
- **Etcetera-type diagnoses (be very careful)**

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Who Benefits From HBOT?

- There are no tests to predetermine who will and who will not respond to a clinical trial of HBOT. Therefore, for families who *can truly afford* to try HBOT without hurting the rest of the family's overall financial needs, I recommend a *"diagnostic clinical trial".*
- In my practice, 90% of those who respond to methyl-B_{12} will show at least a mild response to HBOT. These mild changes will continue to increase over time as HBOT is continued with a proven protocol.

Who Should Not Use HBOT?

- Patients with “uncontrolled” seizures
- True mitochondrial “disease” which is not the same as mitochondrial “distress”
- Severe sinusitis if unable to “equalize” the pressure gradients that are created
- Untreated pneumothorax
- Selected medications, especially cancer medications

What Are The Side Effects?

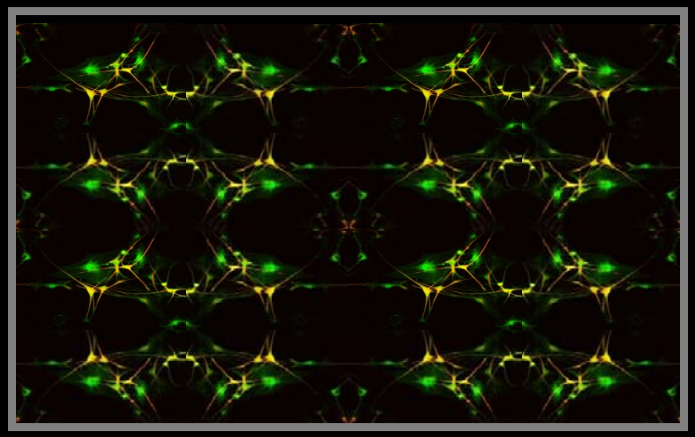
- Seizures (0.01 - 0.03% which is equivalent to an increase in only 1 to 3 persons per 10,000 people)
- Barotrauma (2%)
- “Squeezing” of the sinuses, middle ears, teeth
- Serous otitis media secondary to barotrauma
- Reversible myopia
- Though not a true side effect, many adults are claustrophobic. This is rare in children

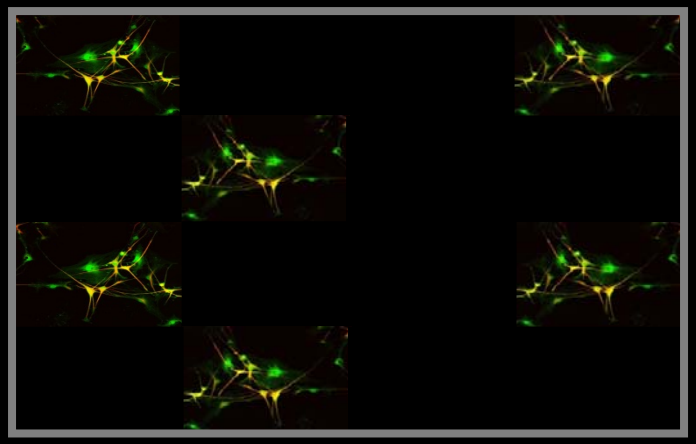
What Are The Side Effects?

- Hyperactivity is almost universal~!
  (Especially with my diagnostic soft chamber protocol)
- Unpublished study from my clinic
  - HBOT increased the alpha 1 brain wave frequency. This is the frequency that gathers great amounts of *neuronal information.*
  - This information is then sent to the parietal-occipital area of the brain that has been shown to process information 275% slower in children with autism due to the *"locked down"* alpha 2 frequency.
  - The result is much more stimuli being sent to a processing center that can not keep up with the increased demand!

Thatcher, RW, et. al., Autism and EEG phase reset: deficient GABA mediated inhibition in thalamo-cortical circuits. Developmental Neuropsychology, 34(6), 780-800, 2009.

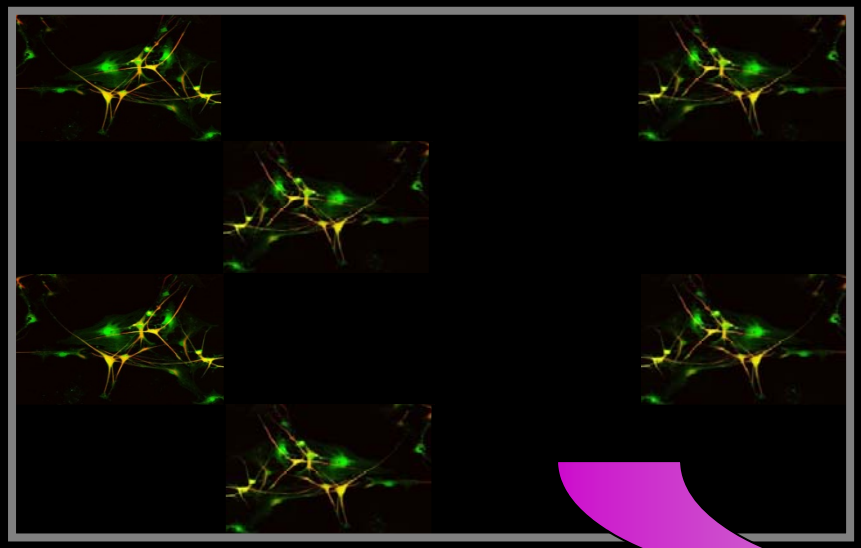
The Number of Neurons Recruited Per Unit Time

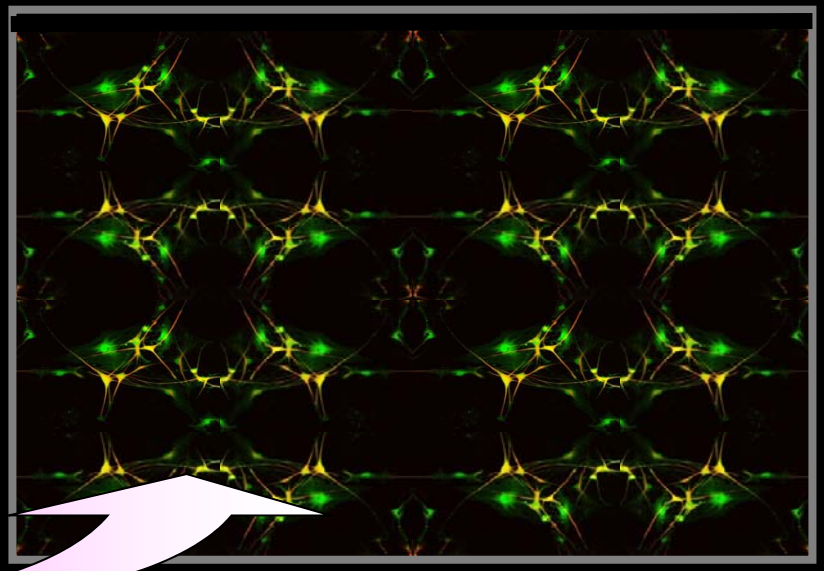




Normal Brain

Autistic Brain





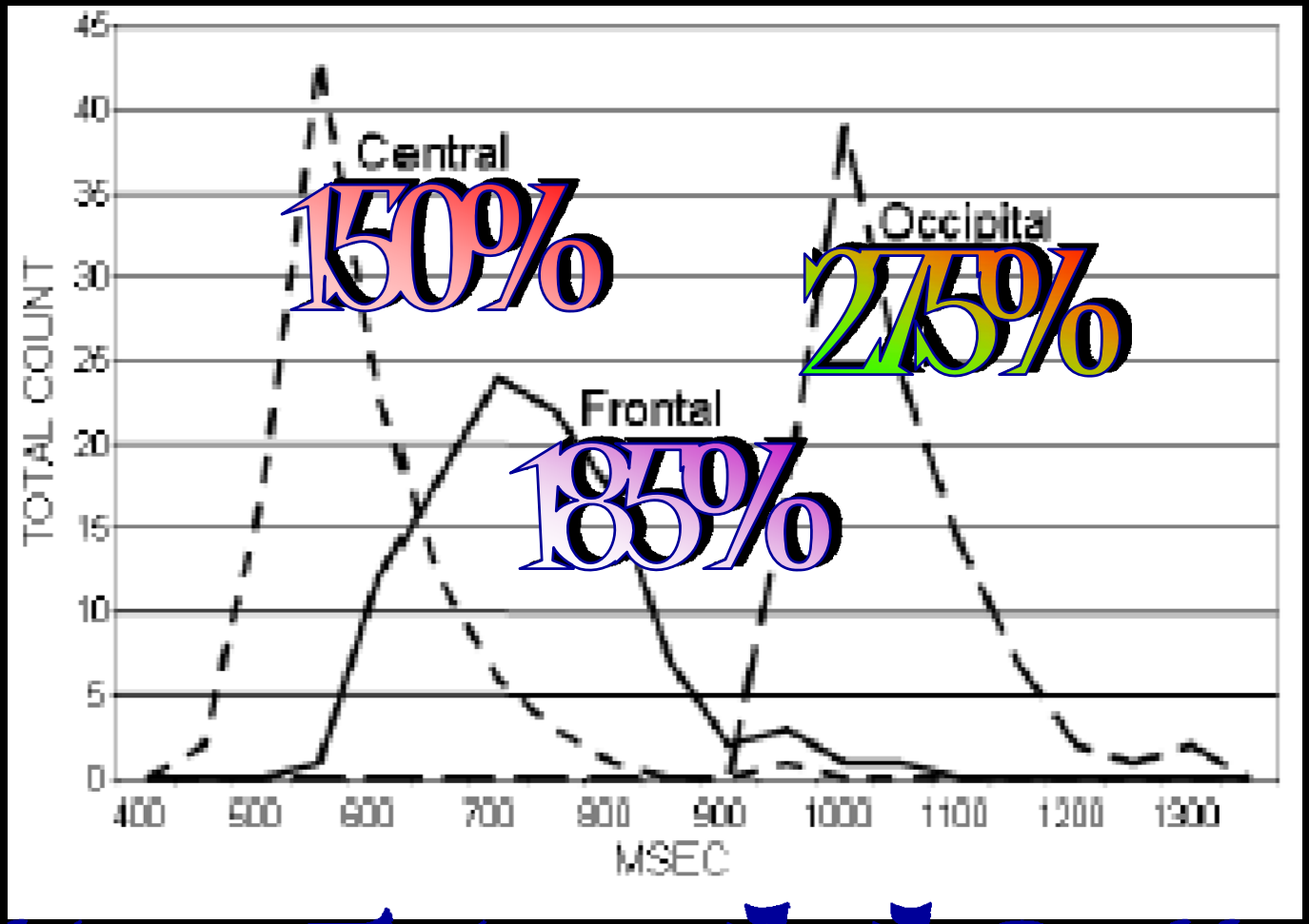
HBOT- high pressure
HBOT- low pressure
Methyl-B_{12} shots

This is the job of the Alpha 1 brain wave frequency

Alpha-2 Phase Lock Duration
Short Distance Electrodes

MORE TIME

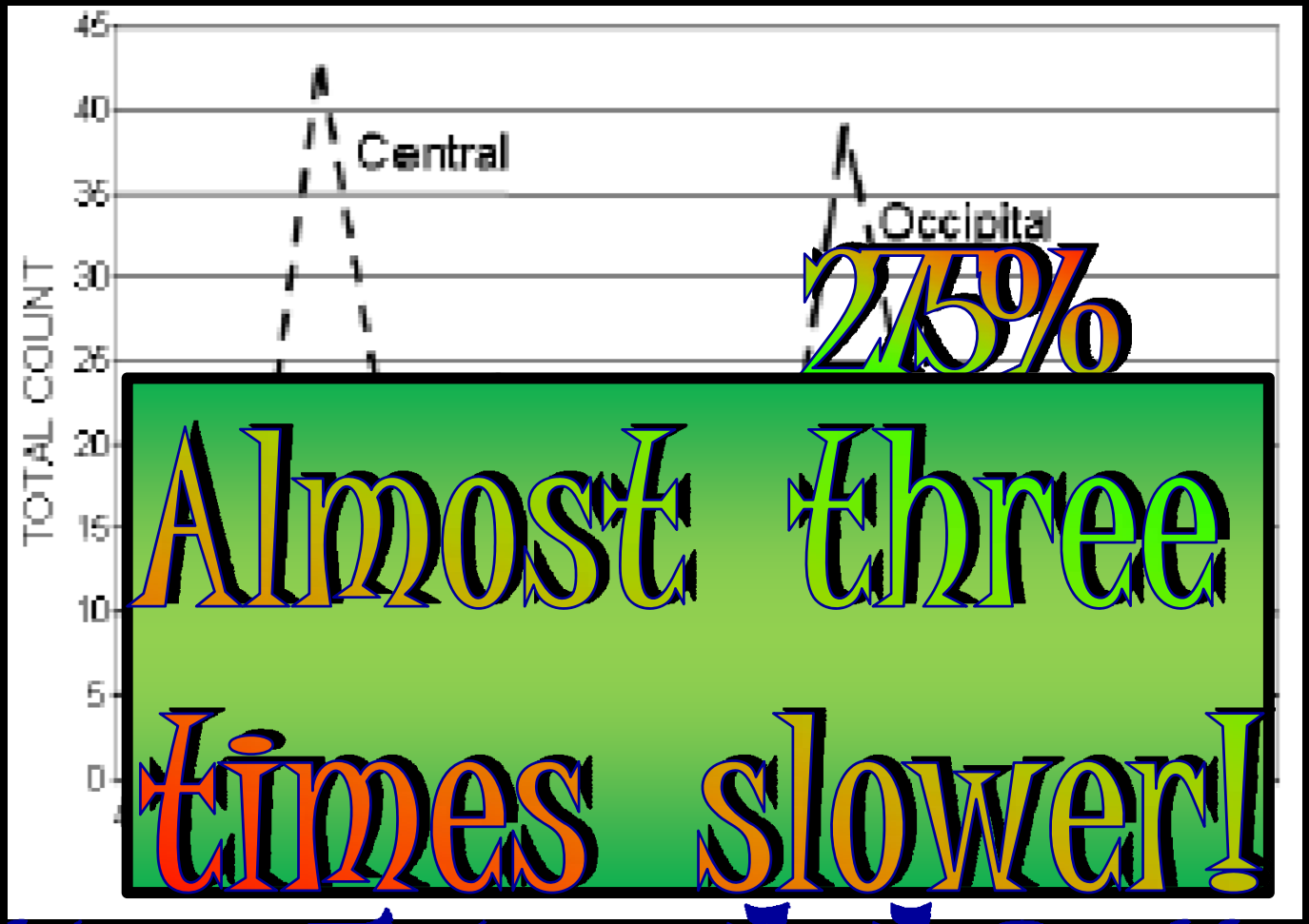
TO PROCESS



Autism Trimodal Pattern

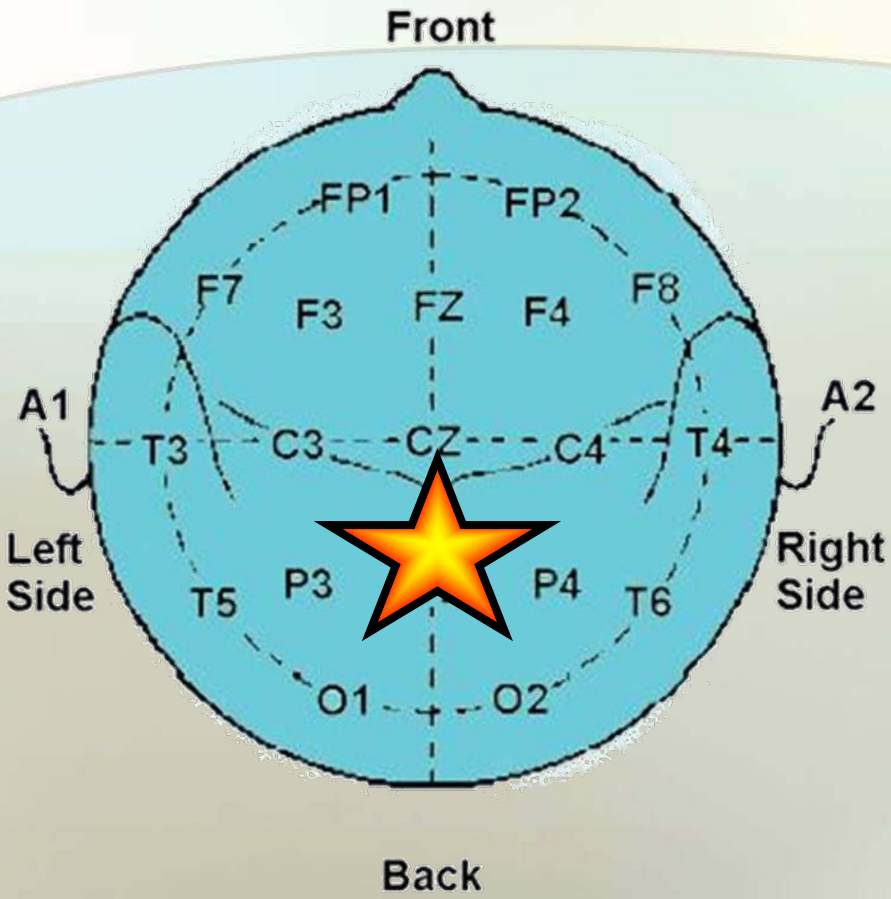
Alpha-2 Phase Lock Duration
Short Distance Electrodes

MORE TIME TO PROCESS

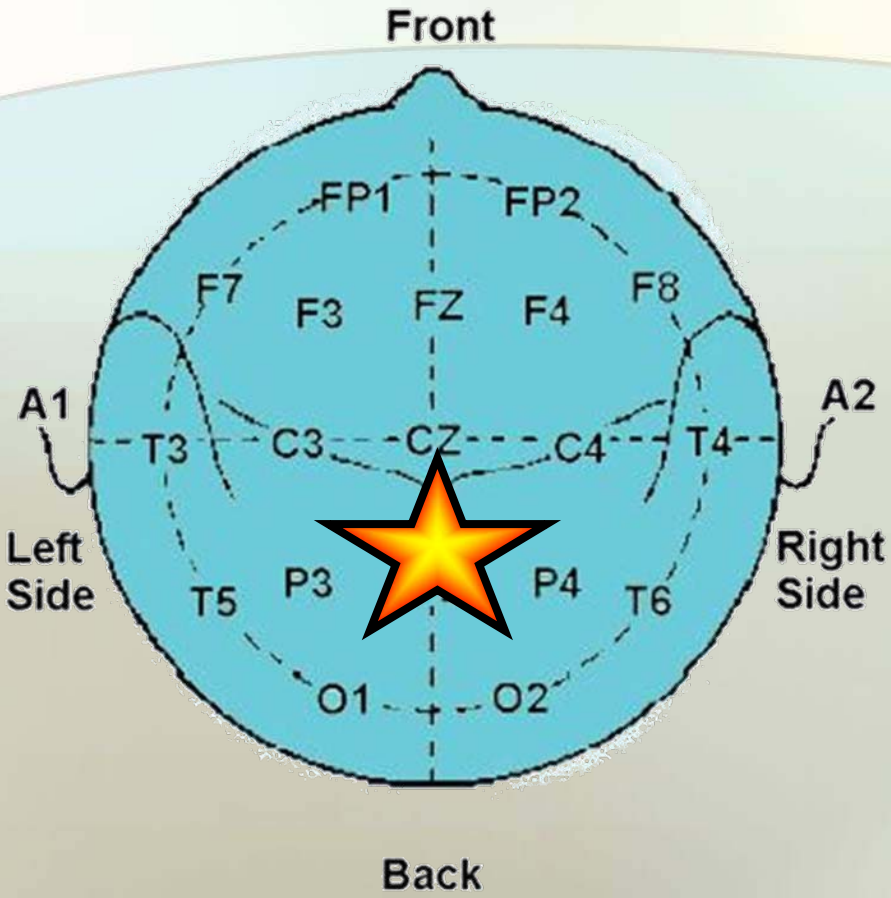


Autism Trimodal Pattern

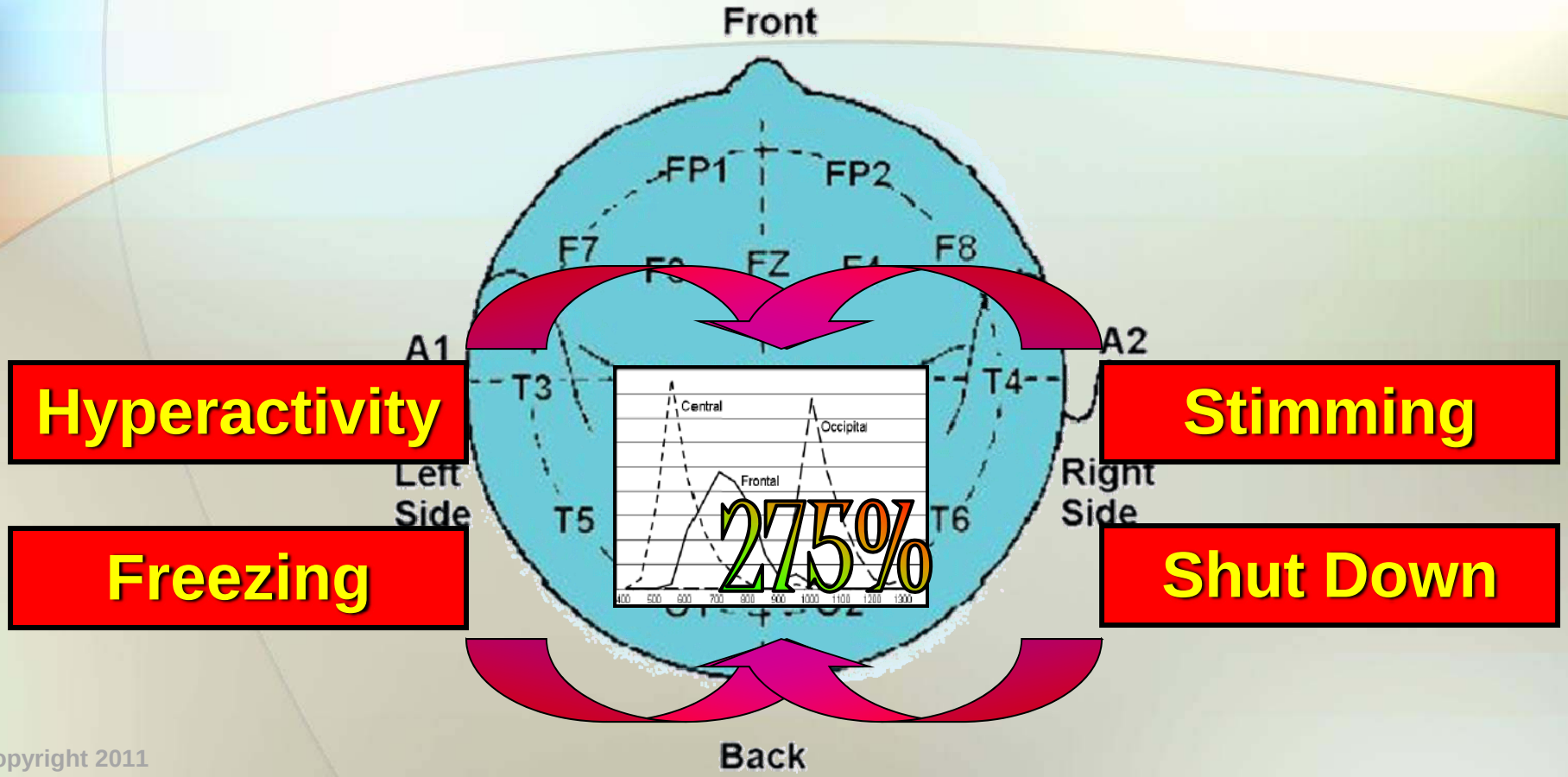
Increases In Alpha-1 Increase The Number Of Neurons That Will Then Send Information To…



CENTRAL COMMAND where EVERYTHING you touch, taste, smell, feel, see, or hear must go to be processed



But The Process Is Locked Down In Alpha-2 And Therefore Slowed Up By Almost Three Times!



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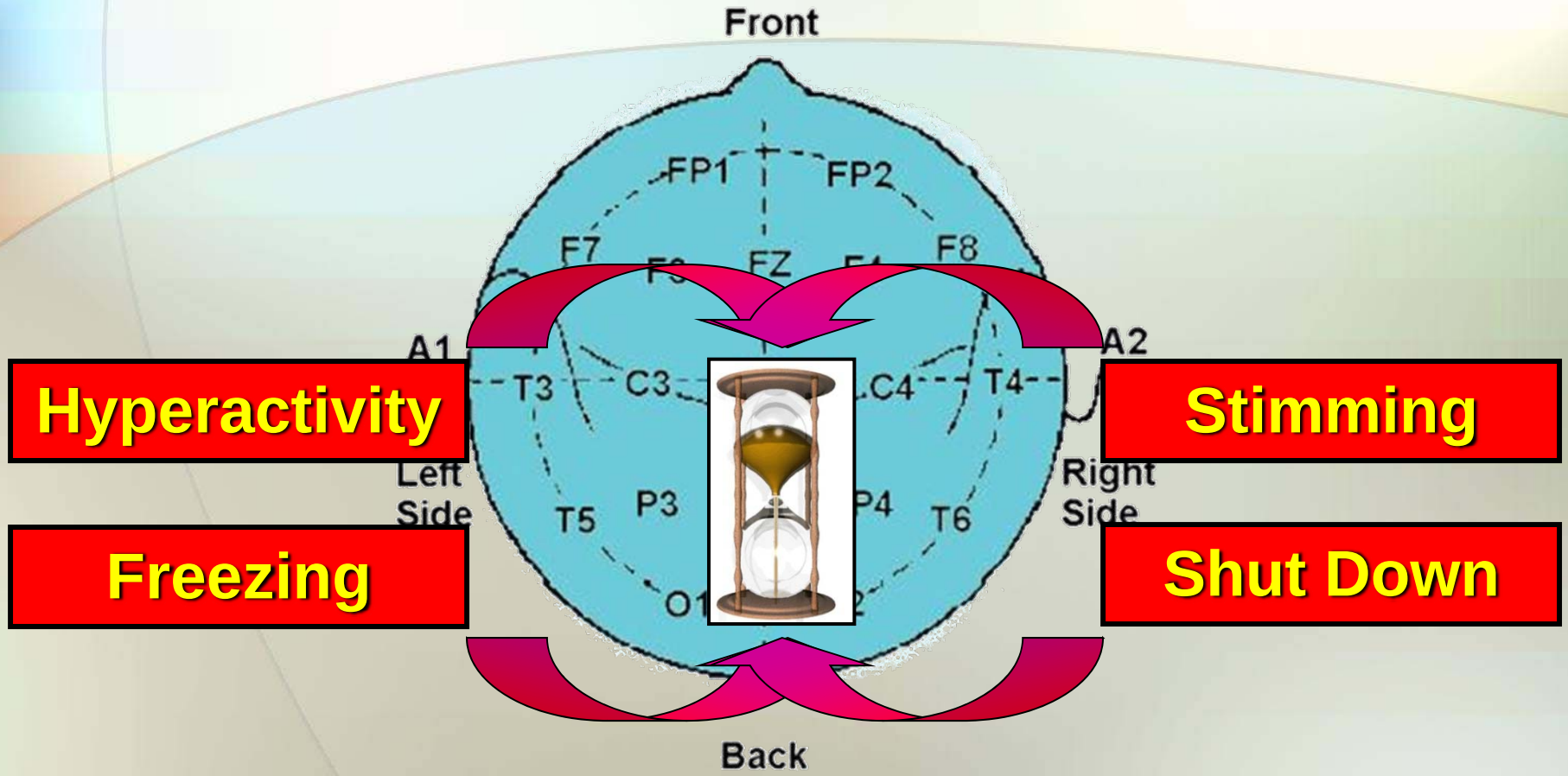
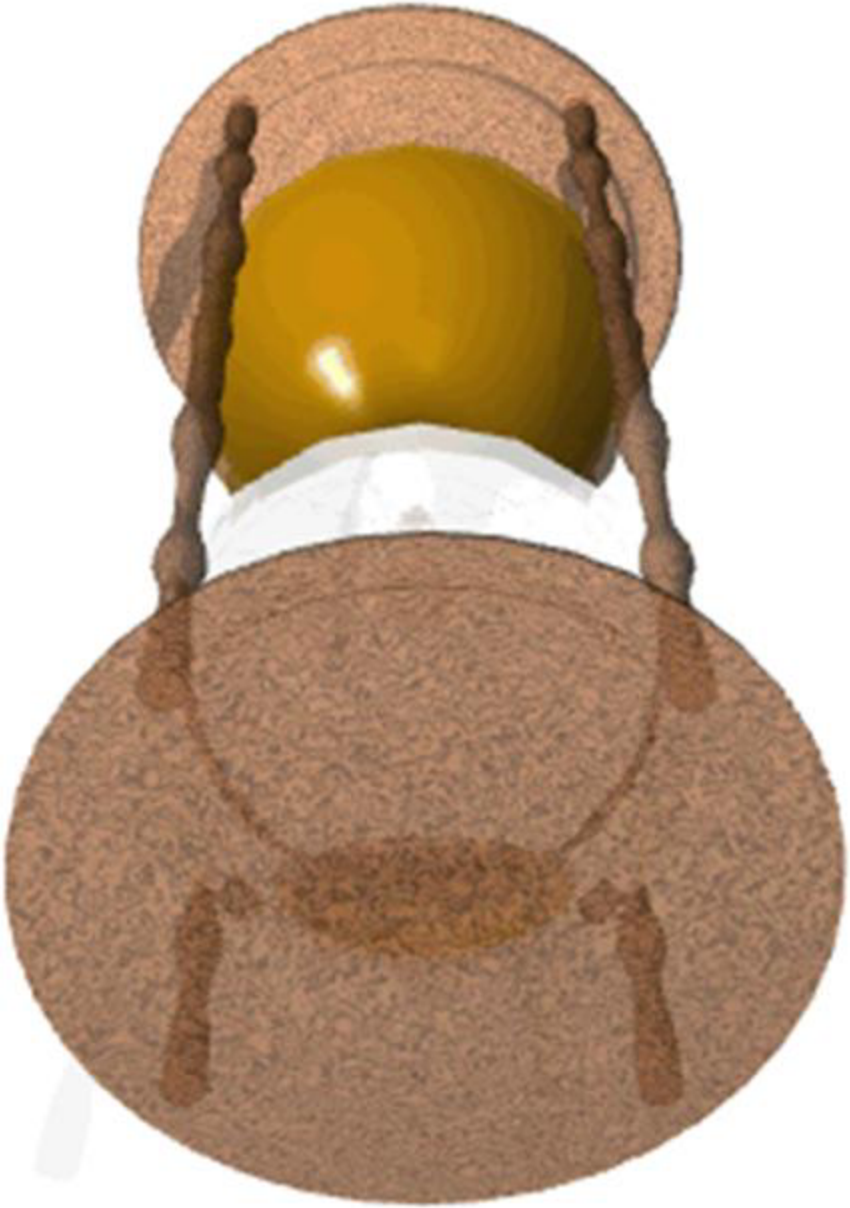
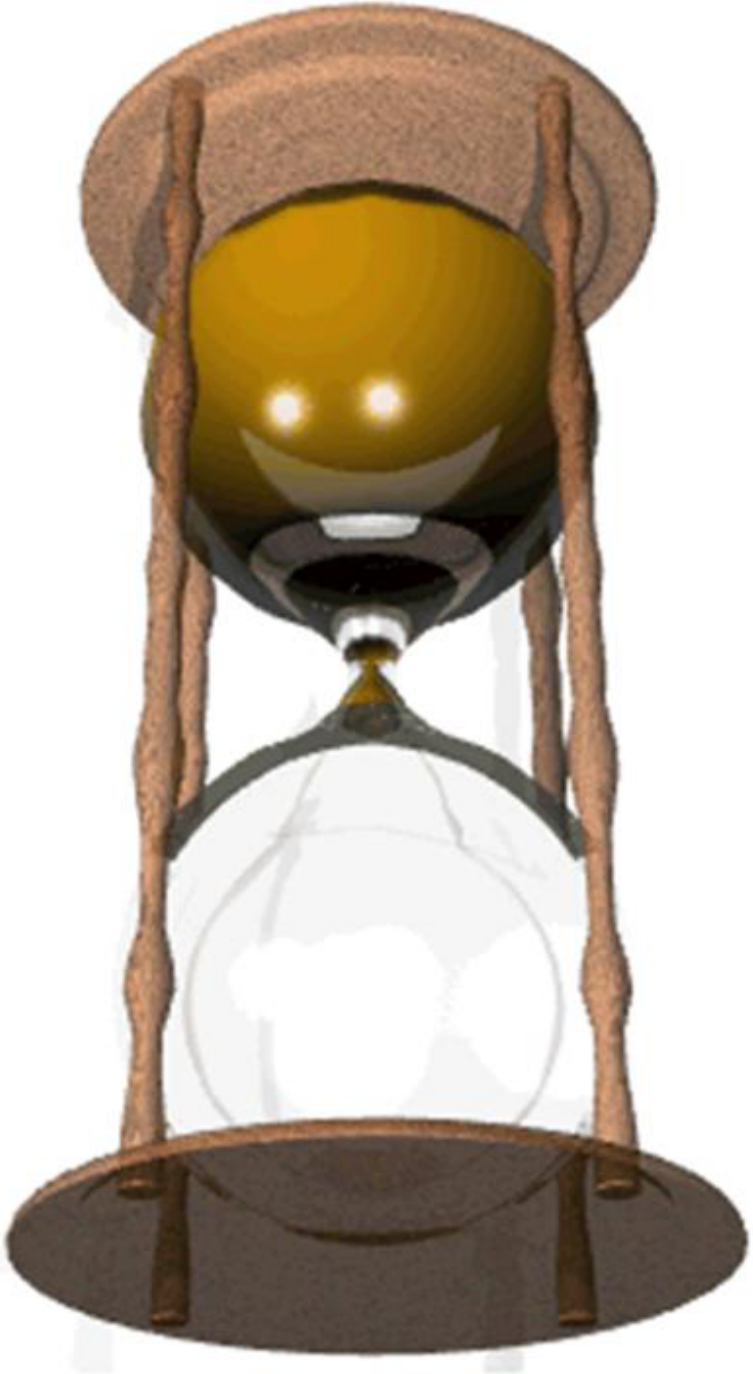
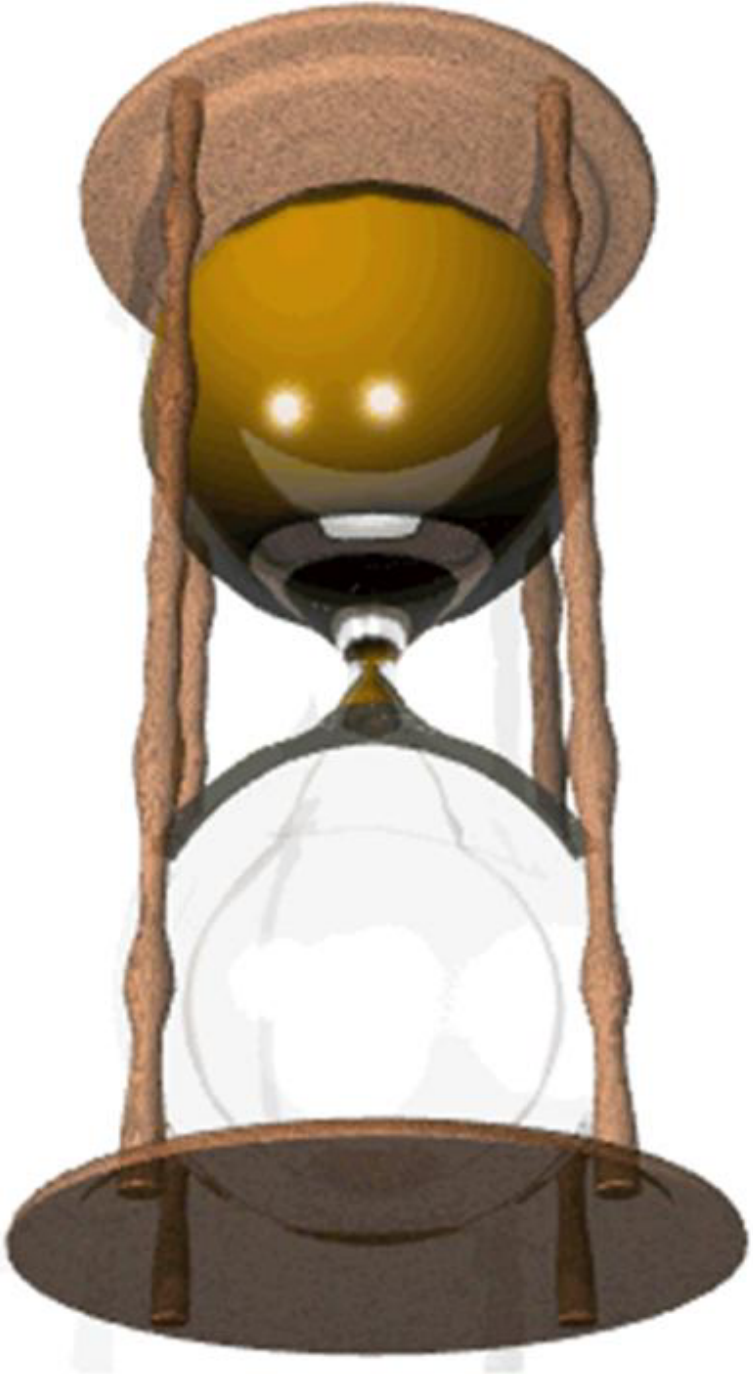
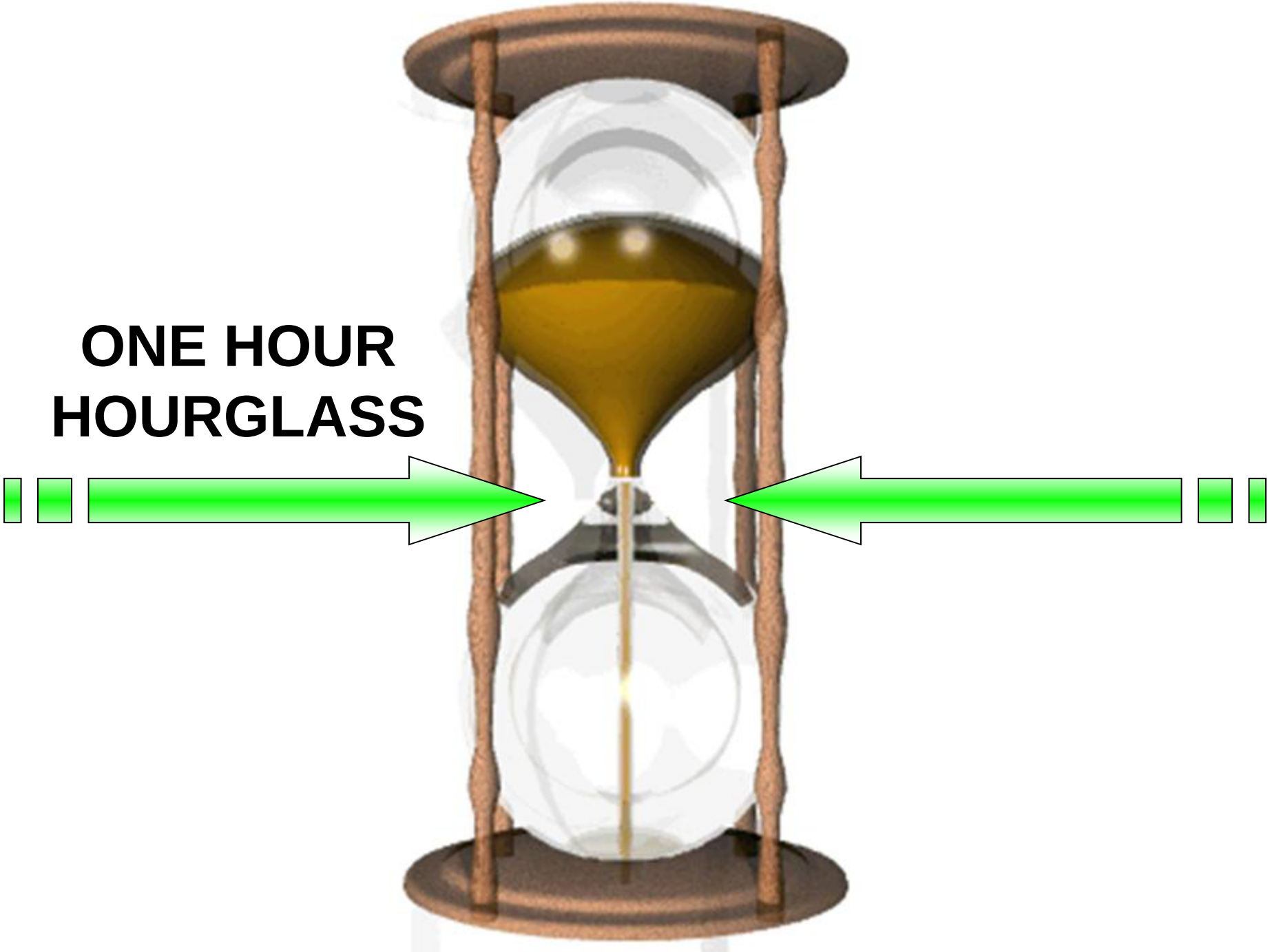


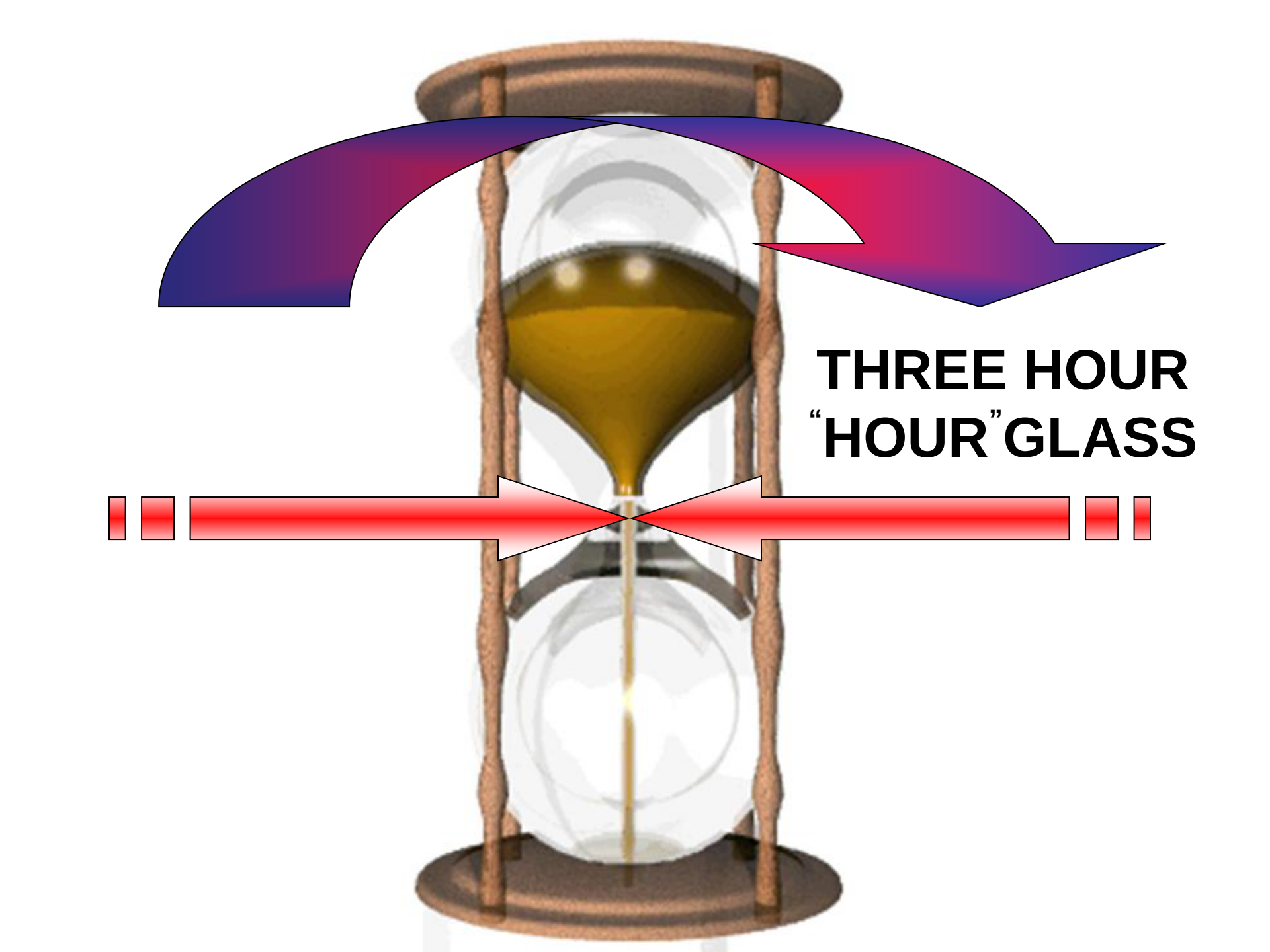






ONE HOUR HOURGLASS

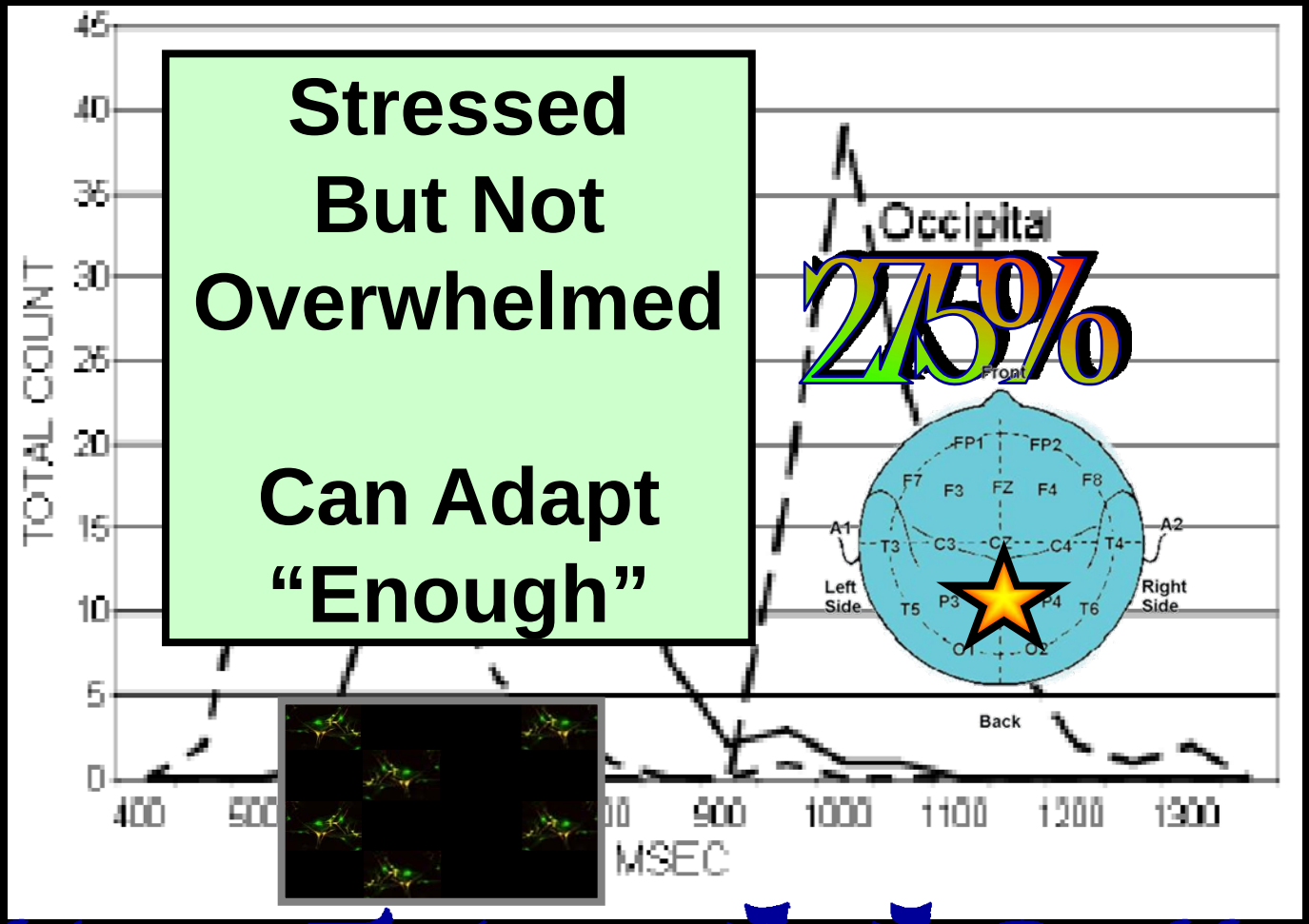



THREE HOUR
"HOUR" GLASS

Alpha-2 Phase Lock Duration
Short Distance Electrodes

MORE TIME

TO PROCESS



Autism Trimodal Pattern

Alpha-2 Phase Lock Duration
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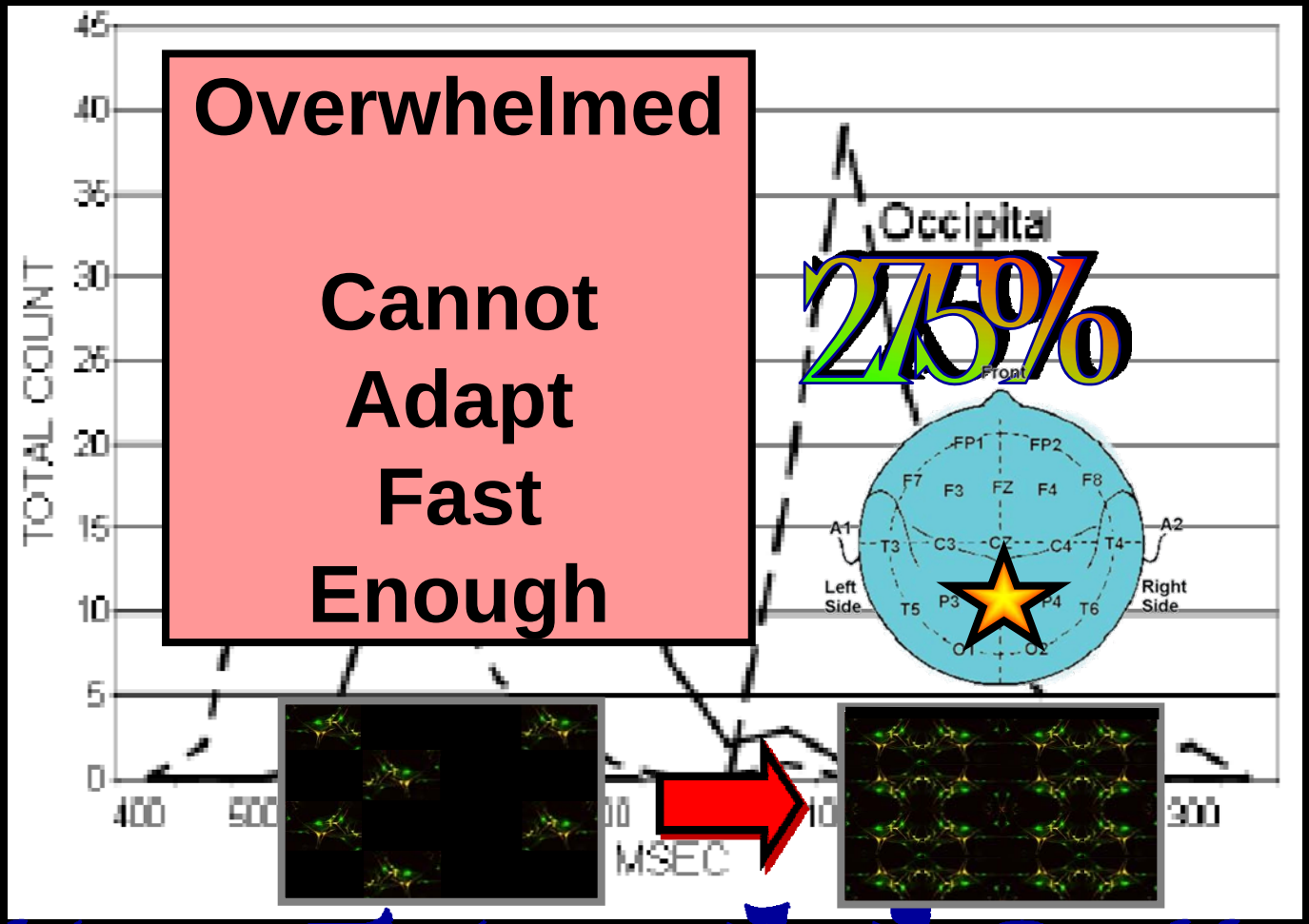
MORE TIME

TO PROCESS



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What Needs To Be In Place Before Starting HBOT For It To Work Most Effectively

- As a general rule, I do not “rush” to do HBOT until my patients have already been on the following for several months:
  - Methyl-B_{12} injections
  - A complete mix of vitamins, minerals, and omega 3 fatty acids
  - An appropriate diet
  - GI “control” (if needed)
  - Agents that support the glutathione pathway
  - Agents that support the immune system
  - Agents that support the mitochondria

What Needs To Be In Place Before Starting HBOT For It To Work Most Effectively

- Chelation does not need to be started, in process, or completed before doing HBOT.
- The tremendous clinical response we have observed from our patient population does not support the claim that HBOT will not work, or that it will not work as effectively, unless a child has been chelated.

What Needs To Be In Place Before Starting HBOT For It To Work Most Effectively

- HBOT should be delayed when Lymes, PANDAS and strep infections are documented to be present.
- HBOT should not necessarily be delayed just because Lymes, PANDAS and strep are suspected to be present due to symptom complexes that are shared by many other etiologies.

What Needs To Be In Place Before Starting HBOT For It To Work Most Effectively

- When the basic prerequisites (previously shown) are in place, HBOT will work to some degree in the majority of children.
- It has been my observation that parents who delay an HBOT “diagnostic clinical trial” in an attempt to rule out every possible disease or disorder with expensive testing will only delay one of the most powerful synergistic treatments I have for children on the spectrum, including the induction of language.

What Needs To Be In Place
Exceptions To My Rules

- When patients come from foreign countries, though not my preference, I start methyl-B_{12}, key supplements, and HBOT simultaneously.
- If the patient's symptoms are consistent with a GI problem, I treat this at the same time.
- In general, I try not to make a lot of simultaneous changes so that I can know what is and what is not working.

Which Are The Supporting Supplements

- Because I always use methyl-$B_{12,}$ the methylation/transsulfuration pathway requires Mg^{++}, Zn^{++}, and $B_{6.}$
- For antioxidant support, I use vitamins A, C, D, E, and the mineral selenium
- I include omega 3 essential fatty acids.

Which Are The Supporting Supplements

- If a patient is not already taking folic acid, folinic acid, or methylfolate, I delay adding them until the patient has completed the HBOT diagnostic protocol. The reason for this is because the “folates” and my HBOT diagnostic protocol increase hyperactivity more often than not, especially when combined with my methyl-B_{12} protocols.
- In the future, folates are included in the patient’s treatment program as needed.

Which Are The Supporting Supplements

- "Special" medications or supplements are always prescribed when the patient's history so indicates. At times, initiating HBOT may need to be delayed:
  - GI medications, e.g. antifungals, antibiotics, probiotics, prebiotics
  - Agents that induce, salvage, or recycle glutathione (too many to list)
  - Agents that support the immune system and treat inflammation or infections (too many to list)
  - Agents that support the mitochondria (too many to list)

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What Works Best?
Hard Chamber or Soft Chamber?

- These questions have no answer
- Both work well for most children
- The primary factor that determines the success rate is the protocol that is used

What are the variables that influence the effectiveness of the treatment?

- Oxygen concentration
- Pressure used
- Treatment time per session
- Number of sessions per day
- Time interval between sessions
- Number of sessions per week
- Total hours per treatment “set”
- Whether or not a “break” is used between sets

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The Treatment Protocol One Should Use Depends Upon Several Factors

- Ease of access to an HBOT clinic
- One's financial situation
- How much the family expects to achieve per treatment "set"
- The family's ability to continue treatments if their child is found to be an HBOT responder
- And if continued, what protocol or protocols they will be using in the future

Diagnosing The Problem

- The purpose of the first set, the “diagnostic set”, is to determine whether or not the child is an HBOT responder.
- If a child is found to be a responder, the next challenge is to determine how to help the family continue HBOT treatment long-term according to one of the protocols that has been shown to work well.

My Biggest Challenge With The Parents

Understanding What Demonstrates Treatment Response from Treatment Failure

- Wanting too much too soon – *this is not realistic*
- Believing Internet posts but not knowing all the facts required for an accurate interpretation
  - Positive parent blogs say how great HBOT worked while a family didn't see "great" for their child
  - Negative parent blogs say how HBOT didn't work so a family may not even try it for their child
  - "Comparison blogs" say X protocol works better than Y protocol without collecting data as we have done

My Biggest Challenge With The Parents

Understanding What Demonstrates Treatment Response from Treatment Failure

HBOT is a process, not an event~!

- There are 126 symptoms that our combined parent pool has reported over the years.
- The average number of responses from an initial “set” is usually between 20-35.
- Most initial responses are mild, some are moderate in intensity, and occasionally some children’s responses can be very strong.

Common Parental Observations From Hyperbaric O_2 Therapy

- Increased language: expressive, receptive, conversational, sentence length and complexity
- Increased level of awareness and understanding
- More opinionated, independent, and self confident
- Increased eye contact and more “present”
- Increased degree of socialization, imaginative and interactive play, and engagement with others
- In touch with feelings: self and others
- Makes his or her requests known by several methods: language, gestures, etc.
- More flexible, frustrated less, transitions easier
- Improved GI symptoms, stools, potty training

Common "Nuisance" Side Effects

- Increased hyperactivity
- Increased stimming
- There are many *"positive-negative"* side effects that are usually related to a greater degree of…
  - √ Awareness
  - √ Self confidence, self assuredness, self assertiveness, showing independence
  - √ Wanting his or her personal opinions acknowledged and attended to~!

These Are Good Things Expressed Badly!

My Biggest Challenge With The Parents

Understanding What Demonstrates Treatment Response from Treatment Failure

- Knowing how to recognize an HBOT response from responses that are due to other simultaneous treatments
  - For the “diagnostic set”, we allow no other treatment variables to be added, deleted, or modified
  - For the “diagnostic set”, we have parents complete the HBOT Parent Designed Report Form, create their own set of “groupings”, and complete a “before and after” document for comparative purposes

24-7/365

Filling In Your Pegboard!

- Allow no other “biomedical” changes to be made during the “diagnostic phase”.
- Imagine your pegboard having a thousand holes.
- Parents, teachers, therapists, other family members, bus drivers, crossing guards, and even the dog and the cat are given a bunch of pegs.
- During the diagnostic phase, a peg is put into the imaginary pegboard for everything wanted that is new, or that occurs with an increased frequency or increased intensity.
- During the diagnostic phase, a peg is put into the imaginary pegboard for everything that is not wanted that stops, or that occurs with a lesser frequency or lesser intensity.

Then <u>You</u> Make The Call~!

A Packet Of Mixed Seeds

Making The Diagnosis – Then Treating The Patient

- You are given a packet of *100 unidentified seeds* that contain many flower, bushes, and tree seeds.
- You plant the seeds when you begin your "diagnostic protocol".
- You look at your seeds at the end of your diagnostic protocol.
- You tell me know how many pretty flowers, bushes, and trees you have. The answer will be, "None." However, you will have identified germination and life.
- Therefore you will keep weeding, watering, and fertilizing your HBOT garden over the next few years so it will produce the beautiful landscape you want to see for your child's home~!

Once A Child Is Found To Be An HBOT Responder, Our Goal Is To Find A Way For The Child To Continue Treatment For An Extended Period Of Time

- Soft chamber home use allows for “practical continuity of care” of a good treatment whose mechanisms of action (oxygen, pressure, treatment time) will allow additional benefits to be realized over time while the “cost per treatment” decreases because the parents own or share a chamber. In addition, by owning or sharing a chamber, their time commitment to continue this valuable treatment is “within reason” and it is on their own time schedule.

Once A Child Is Found To Be An HBOT Responder, Our Goal Is To Find A Way For The Child To Continue Treatment For An Extended Period Of Time

- Hard chamber use is excellent for intermittent treatment sets but is “impractical for continuity of care” due to the significant distances clinics are away from families. Therefore, to continue to be treated would require significant time commitments that are not feasible for most families. In addition, the “cost per treatment” remains the same and is not able to be amortized over time as it is for families who own or share a chamber and whose cost per treatment decreases the longer they use the chamber.

The Break
A Profitable Little Bonus~!

- In our clinic we often find that to achieve the maximum benefit from a “set” of HBOT dives, there must be a break of several weeks.
- We find that the “month on—month off” soft chamber protocol works well and therefore provides the added bonus whereby two families can share the cost of a chamber to *continue treatment for 2 to 3 years or more*.
- Though most parents get bored after doing HBOT for 2 to 3 years, especially because they no longer see significant results, it is important to remember that this only represents 1 to 1.5 years of actual treatment.

The Break
A Different Story With Hard Chamber

- Hard chamber protocols have a break between sessions once the child reaches the “set” goal for the number of treatment hours (the most common number is 40 treatment hours).
- Repeat sets of hard chamber HBOT dives are usually delayed many months due to the high cost involved to continue them and the driving distance from the clinic. This demographic issue requires a lot of extra time off from work and other serious time commitments from parents who are already struggling to juggle their schedules in order for their child to partake of many different types of therapies.

What Are Some Of My Common Protocols?

- **Once daily treatment variables**
  - One hour per session (at pressure)
  - 1.5 hours per session (at pressure)
  - 1.3, 1.5, or 1.75 atmospheres per session
  - Use of 100% oxygen or oxygen from an oxygen concentrator
  - If using an oxygen concentrator, the use of a mask or the tip of the hose held *very close* to the nose is mandatory for good results
  - The number of sessions per week

What Are Some Of My Common Protocols?

- **Twice daily treatment variables**
  - One hour per session (at pressure)
  - 1.5 hours per session (at pressure)
  - 1.3, 1.5, or 1.75 atmospheres per session
  - Use of 100% oxygen or oxygen from an oxygen concentrator
  - If using an oxygen concentrator, the use of a mask or the tip of the hose held *very close* to the nose is mandatory for good results
  - The number of sessions per week
  - The time required between sessions
  - Whether or not the sessions are of equal length

What Are The Important Variables?

- **The effects of oxygen independent of pressure, the length of each treatment, the frequency of treatments, or the total number of treatments per "set".**

- **The effects of pressure independent of oxygen concentration, the length of each treatment, the frequency of treatments, or the total number of treatments per "set".**

What Are The Important Variables?

- **The effects of the length of each treatment** independent of the time interval between treatments, the frequency of treatments, the total number of treatments per "set", the oxygen concentration, and the pressure used.

- **The effects of the frequency of each treatment** independent of the time interval between treatments, the length of treatments, the total number of treatments per "set", the oxygen concentration, and the pressure used.

What Are The Important Variables?

- **The effects of the total number of treatments per "set"** independent of the length of each treatment, the time interval between treatments, the frequency of treatments, the oxygen concentration, and the pressure used.

- **The effects of the time interval between treatments** independent of the length of treatments, the frequency of each treatment, the total number of treatments per "set", the oxygen concentration, and the pressure used.

Consider These “Theoreticals”

- **Time units per 24 hours (time per session) (TUs)**
- **Pressure units per 24 hours (PUs)**
- **Oxygen units per 24 hours (OUs)**
- **“Cellular product” units per 24 hours (CPUs)**

Consider These “Theoreticals”

- **Time units per 5 day “weeks” (TUs)**
- **Pressure units per 5 day “weeks” (PUs)**
- **Oxygen units per 5 day “weeks” (OUs)**
- **“Cellular product” units per 5 day “weeks” (CPUs)**

Consider These “Theoreticals”

- **Time units per 6 day “weeks”**
  (TUs)
- **Pressure units per 6 day “weeks”**
  (PUs)
- **Oxygen units per 6 day “weeks”**
  (OUs)
- **“Cellular product” units per 6 day “weeks”**
  (CPUs)

Consider These “Theoreticals”

- Time units per 7 day “weeks”
  (TUs)
- Pressure units per 7 day “weeks”
  (PUs)
- Oxygen units per 7 day “weeks”
  (OUs)
- “Cellular product” units per 7 day “weeks”
  (CPUs)

You Do
"The Math Concept"

It is important to understand that the

"Principle Applies"
though the
"Absolute Values"
will not

Concentrations at various tissue levels will not be exactly as calculated due to multiple variables involved with oxygen and pressure physiology and variables related to time and duration.

Time Units Per 24 Hours

- 1 hour produces 1 TU
- 1.5 hours produces 1.5 TU
- 2 hours produces 2 TU
- 2.5 hours produces 2.5 TU
- 3 hours produces 3 TU

Oxygen Units Per 24 Hours

- 100% oxygen
- 92% from oxygen concentrator
  - Diluted to “38.5%?” (for ease of math)
  - 40%?
  - 45%?
  - 50%?

Oxygen Units Per 24 Hours

- 100% oxygen produces 1 OU
- 92% from oxygen concentrator
  - Diluted to “38.5%” produces 0.385 OU
  - 40% produces 0.4 OU
  - 45% produces 0.45 OU
  - 50% produces 0.5 OU

Pressure Units Per 24 Hours

- **1.3 atmospheres produces 1.3 PU**
- **1.5 atmospheres produces 1.5 PU**
- **1.75 atmospheres produces 1.75 PU**

“Cellular Product Units” Per 24 Hours

- 1 hour produces 1 CPU
- 1.5 hours produces 1.5 CPU
- 2 hours produces 2 CPU
- 2.5 hours produces 2.5 CPU
- 3 hours produces 3 CPU

The Variables That Are Involved In "The Hyperbaric Prescription" And Its Ultimate Clinical Effect

- The Barometric Pressure
- The Ambient Temperature
- The Height Above Sea Level
- The Oxygen Concentration Used
- The Amount Of Pressure Used
- The Treatment Time Per Session

Above Sea Level Correction Factor

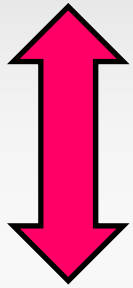
- For every 250 ft above sea level, one must subtract approximately 0.125 psi from the pressure at sea level which is 14.7 psi.
- Variables that are constant or not able to be easily changed when using a soft chamber:
  - Oxygen concentration
  - Pressure used
  - Barometric pressure
  - Temperature
- Therefore the easiest variable to correct for is treatment “time” per session.

Above Sea Level Correction Factor

To do this, increase your
treatment time by 1%
for every 250 ft
you are above sea level

“Diagnostic Protocol”

1.3 atm 38.5% O_2 (?) 1.5 hours/Tx 2x/day 7 days per wk	3 TU
1.5 atm 100% O_2 1 hour/Tx 1 X/day 5 days per wk	1 TU



Protocols	Time Units (TU) per 24 hours	Oxygen Units (OU) per 24 hours	Pressure Units (PU) per 24 hours	Cellular Product Units (CPU) per 24 hours
1.3 atm 38.5% O_2 (?) 1.5 hours 2x/day; 30 consecutive days	3 TU	150 OU (? -- to 195 OU)	3.9 PU	3 CPU
1.5 atm 100% O_2; 1 hour/day; 5 days per wk	1 TU	150 OU	1.5 PU	1 CPU
Comparisons	DP-HBOT 200% more	DP-HBOT Equal up to 30% more	DP-HBOT 160% more	DP-HBOT 200% more

Protocols	Time Units (TU) per 24 hours	Oxygen Units (OU) per 24 hours	Pressure Units (PU) per 24 hours	Cellular Product Units (CPU) per 24 hours
1.3 atm 38.5% O_2 (?) 1.5 hours 2x/day; 30 consecutive days	3 TU	150 OU (? -- to 195 OU)	3.9 PU	3 CPU
1.5 atm; 100% O_2; 1.5 hours per day; 5 days per week	1.5 TU 	225 OU	2.25 PU	1.5 CPU
Comparisons	DP-HBOT 100% more	DP-HBOT 33% less (to 13% less)	DP-HBOT 73% more	DP-HBOT 100% more

Protocols	Time Units (TU) per 24 hours	Oxygen Units (OU) per 24 hours	Pressure Units (PU) per 24 hours	Cellular Product Units (CPU) per 24 hours
1.3 atm 38.5% O_2 (?) 1.5 hours 2x/day; 30 consecutive days	3 TU	150 OU (? -- to 195 OU)	3.9 PU	3 CPU
1.5 atm; 100% O_2; 1.5 hours 2x/day; 5 days per week	3 TU 	450 OU	4.5 PU	3 CPU
Comparisons	DP-HBOT Equal	DP-HBOT 67% less (to 57% less)	DP-HBOT 13% less	DP-HBOT Equal

Effectiveness Factor

1.3 atm 38.5% O_2 (?) 1.5 hours 2x/day; 30 consecutive days
1.5 atm 100% O_2; 1.5 hour/day; 5 days per week

Protocols	Effectiveness Factor (EF) per 24 hours (4 hr vs. 12 hr split)	Continuity Factor (CF) per week	Continuity Factor (CF) per 4 week period	Continuity Factor (CF) per "set" (84 hrs vs. 40 hrs
1.3 atm 38.5% O_2 (?) 1.5 hours 2x/day; 30 consecutive days	Suspect but unknown	21 hours per week	84 hours per 4 week set ("one month")	84 hours in 28 days ("one month")
1.5 atm 100% O_2; 1.5 hour/day; 5 days per week	Not applicable	7.5 hours per week	30 hours per 4 week set ("one month")	40 hours in 37 days ("5.3 weeks")
Comparisons	Not applicable	Diagnostic protocol 280% more	Diagnostic protocol 280% more	Diagnostic protocol 210% more

Continuity Factor

1.3 atm 38.5% O_2 (?) 1.5 hours 2x/day; 30 consecutive days
1.5 atm 100% O_2; 1.5 hour/day; 5 days per week

Can You Expect To See The Same Results?

Three days per week?
Five days per week?
Skipping school?
Weekends off?
Summers off?
Attend all classes?
Attend ½ the time?

Compare This To Going To School

Protocols	Effectiveness Factor (EF) per 24 hours (4 hr vs. 12 hr split)	Continuity Factor (CF) per week	Continuity Factor (CF) per 4 week period	Continuity Factor (CF) per "set" (84 hrs vs. 40 hrs
1.3 atm 38.5% O_2 (?) 1.5 hours 2x/day; 30 consecutive days	Suspect but unknown	21 hours per week	84 hours per 4 week set ("one month")	84 hours in 28 days ("one month")
1.5 atm 100% O_2; 1.5 hour/day; 5 days per week	Not applicable	7.5 hours per week	30 hours per 4 week set ("one month")	40 hours in 37 days ("5.3 weeks")
Comparisons	Not applicable	Diagnostic protocol 180% more	Diagnostic protocol 180% more	Diagnostic protocol 110% more

Protocols	Effectiveness Factor (EF) per 24 hours (4 hr vs. 12 hr split)	Continuity Factor (CF) per week	Continuity Factor (CF) per 4 week period	Continuity Factor (CF) per "set" (84 hrs vs. 40 hrs
1.3 atm 38.5% O_2 (?) 1.5 hours 2x/day; 30 consecutive days	Suspect but unknown	21 hours per week	84 hours per 4 week set ("one month")	84 hours in 28 days ("one month")
1.5 atm 100% O_2; 1.5 hour/day; 6 days per week	Not applicable	9 hours per week	36 hours per 4 week set ("one month")	40 hours in 37 days ("4.4 weeks")
Comparisons	Not applicable	Diagnostic protocol 133% more	Diagnostic protocol 133% more	Diagnostic protocol 110% more

Home Chamber Protocols

1.3 atm	1.3 atm
38.5% O_2 (?)	38.5% O_2 (?)
1.5 hours/session	1.5 hours/session
1x/day M-F	1x/day M-F
1x/day Sat, Sun	2x/day Sat, Sun
7 days per week	7 days per week
10.5 hours/week	13.5 hours/week

Protocols	Time Units (TU) per 24 hours	Oxygen Units (OU) per 24 hours	Pressure Units (PU) per 24 hours	Cellular Product Units (CPU) per 24 hours
1.3 atm 38.5% O_2 (?) 1.5 hours 1x/day; 30 consecutive days	1.5 TU 	75 OU (? -- to 97.5 OU)	1.95 PU	1.5 CPU
1.5 atm 100% O_2 1 hour/day 5 days per wk	1 TU	150 OU	1.5 PU	1 CPU
Comparisons	Home HBOT 50% more	Home HBOT 50% less (to 35% less)	Home HBOT 30% more	Home HBOT 50% more

Protocols	Time Units (TU) per 24 hours	Oxygen Units (OU) per 24 hours	Pressure Units (PU) per 24 hours	Cellular Product Units (CPU) per 24 hours
1.3 atm 38.5% O_2 (?) 1.5 hours 1x/day; 30 consecutive days	1.5 TU	75 OU (? -- to 97.5 OU)	1.95 PU	1.5 CPU
1.5 atm 100% O_2 1.5 hours/day 5 days per wk	1.5 TU	225 OU	2.25 PU	1.5 CPU
Comparisons	Home HBOT Equal	Home HBOT 67% less (to 57% less)	Home HBOT 13% less	Home HBOT Equal

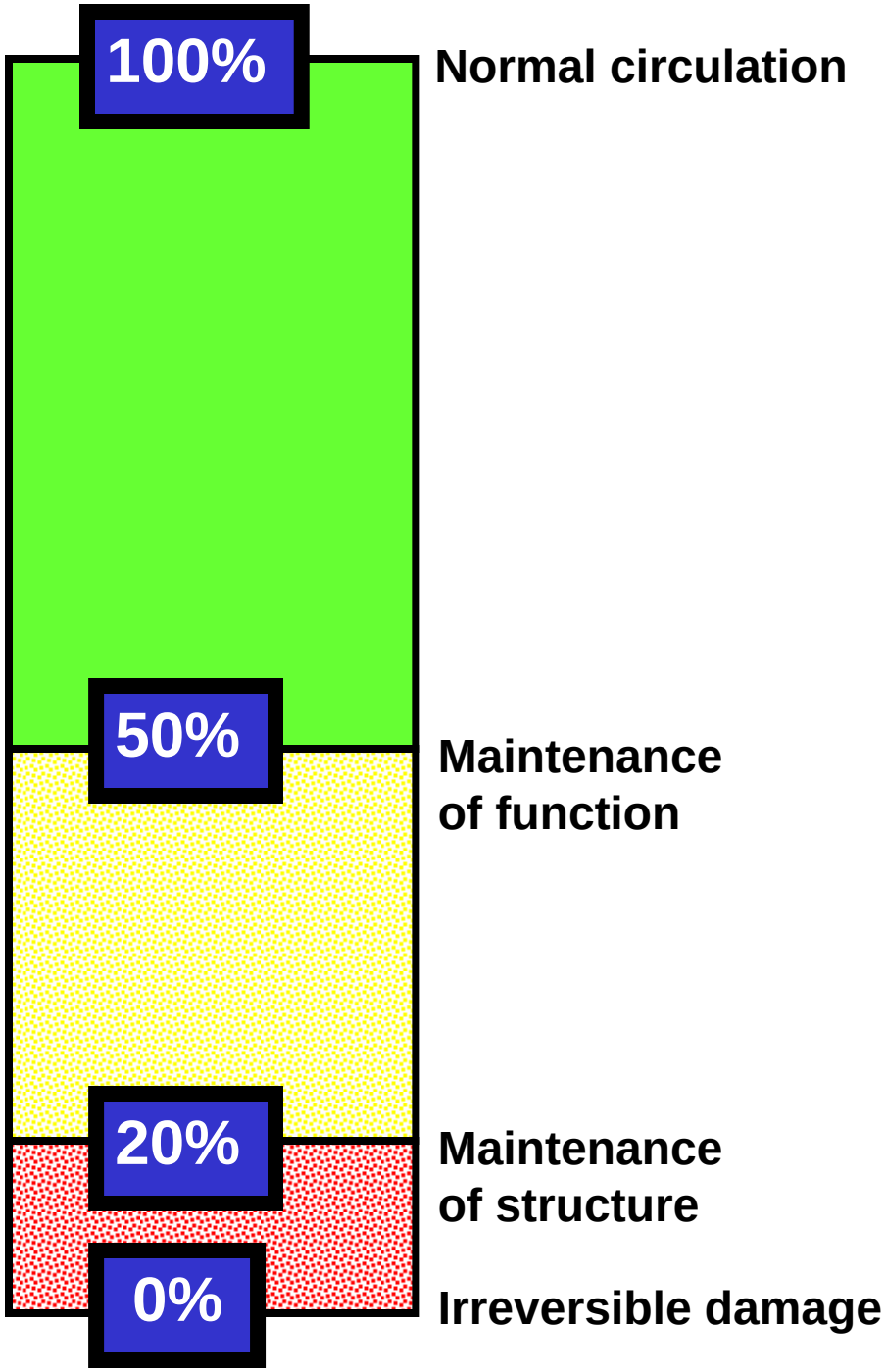
Protocols	Effectiveness Factor (EF) per 24 hours (4 hr vs. 12 hr split)	Continuity Factor (CF) per week	Continuity Factor (CF) per 4 week period	Continuity Factor (CF) per "set" (84 hrs vs. 40 hrs
1.3 atm 38.5% O_2 (?) 1.5 hours 1x/day; 30 consecutive days	Not applicable	10.5 hours per week	42 hours per 4 week set ("one month")	42 hours in 28 days ("one month")
1.5 atm 100% O_2; 1.5 hour/day; 5 days per week	Not applicable	7.5 hours per week	30 hours per 4 week set ("one month")	40 hours in 37 days ("5.3 weeks")
Comparisons	Not applicable	Home protocol 40% more	Home protocol 40% more	Home protocol 5% more

Protocols	Effectiveness Factor (EF) per 24 hours (4 hr vs. 12 hr split)	Continuity Factor (CF) per week	Continuity Factor (CF) per 4 week period	Continuity Factor (CF) per "set" (84 hrs vs. 40 hrs
1.3 atm 38.5% O_2 (?) 1.5 hours 1-2x/day 30 consecutive days	Not applicable	13.5 hours per week	54 hours per 4 week set ("one month")	54 hours in 28 days ("one month")
1.5 atm 100% O_2; 1.5 hour/day; 5 days per week	Not applicable	7.5 hours per week	30 hours per 4 week set ("one month")	40 hours in 37 days ("5.3 weeks")
Comparisons	Not applicable	Home protocol 80% more	Home protocol 80% more	Home protocol 35% more

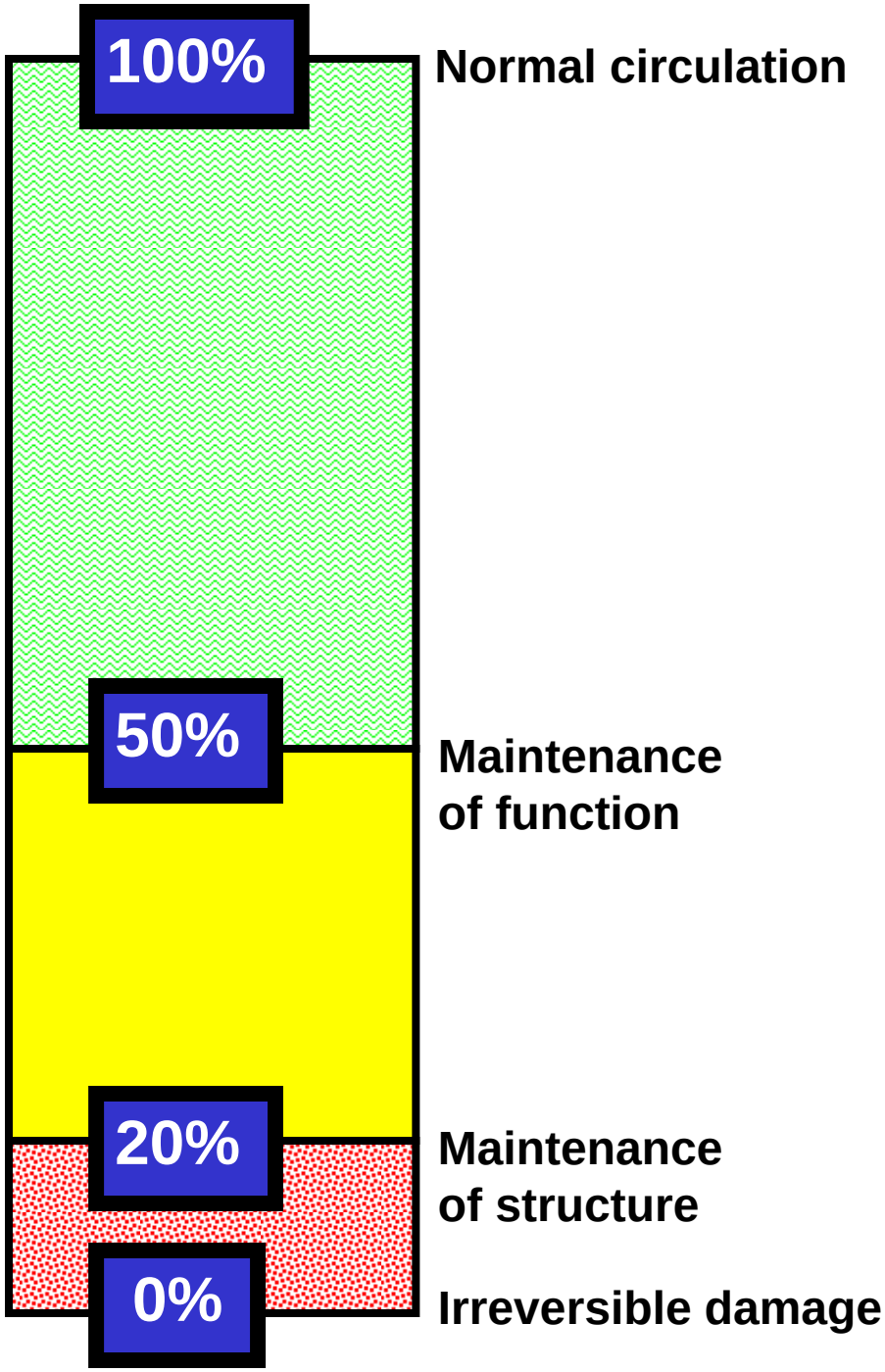
THE ONLY QUESTION YOU HAVE TO ANSWER

Are you willing to wait until I get everything right without any errors in my logic, until those you consider leaders quit fighting about what protocol is best, until definitive research without bias is funded and completed.
or are you going to listen to your heart and think for yourself before time runs out on your child?

An Important Distinction For Autism The Penumbra Effect Is Less Of A Concern



CRITICAL LEVELS OF CEREBRAL BLOOD FLOW REQUIRED FOR MAINTENANCE OF FUNCTION AND STRUCTURE



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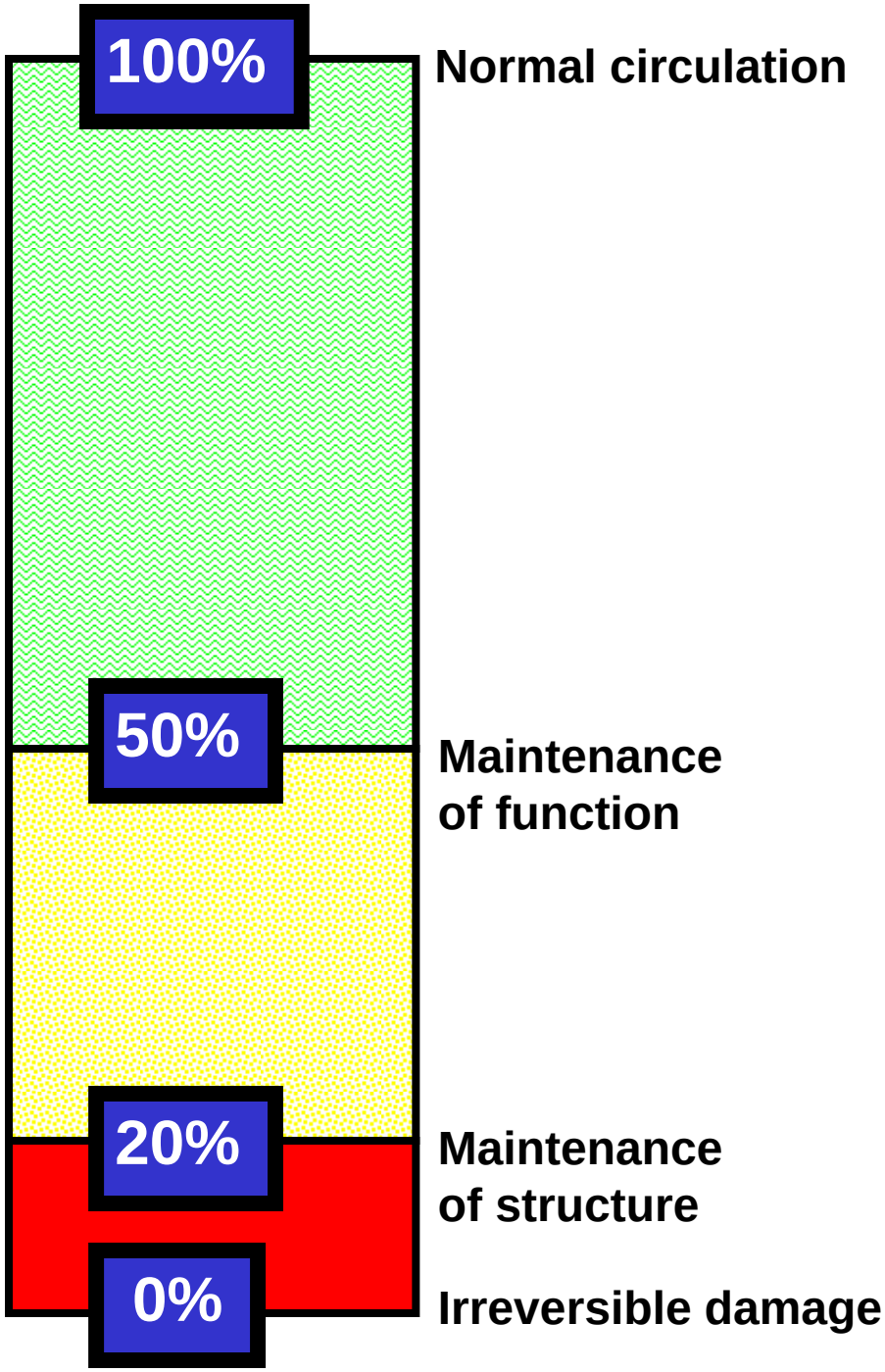

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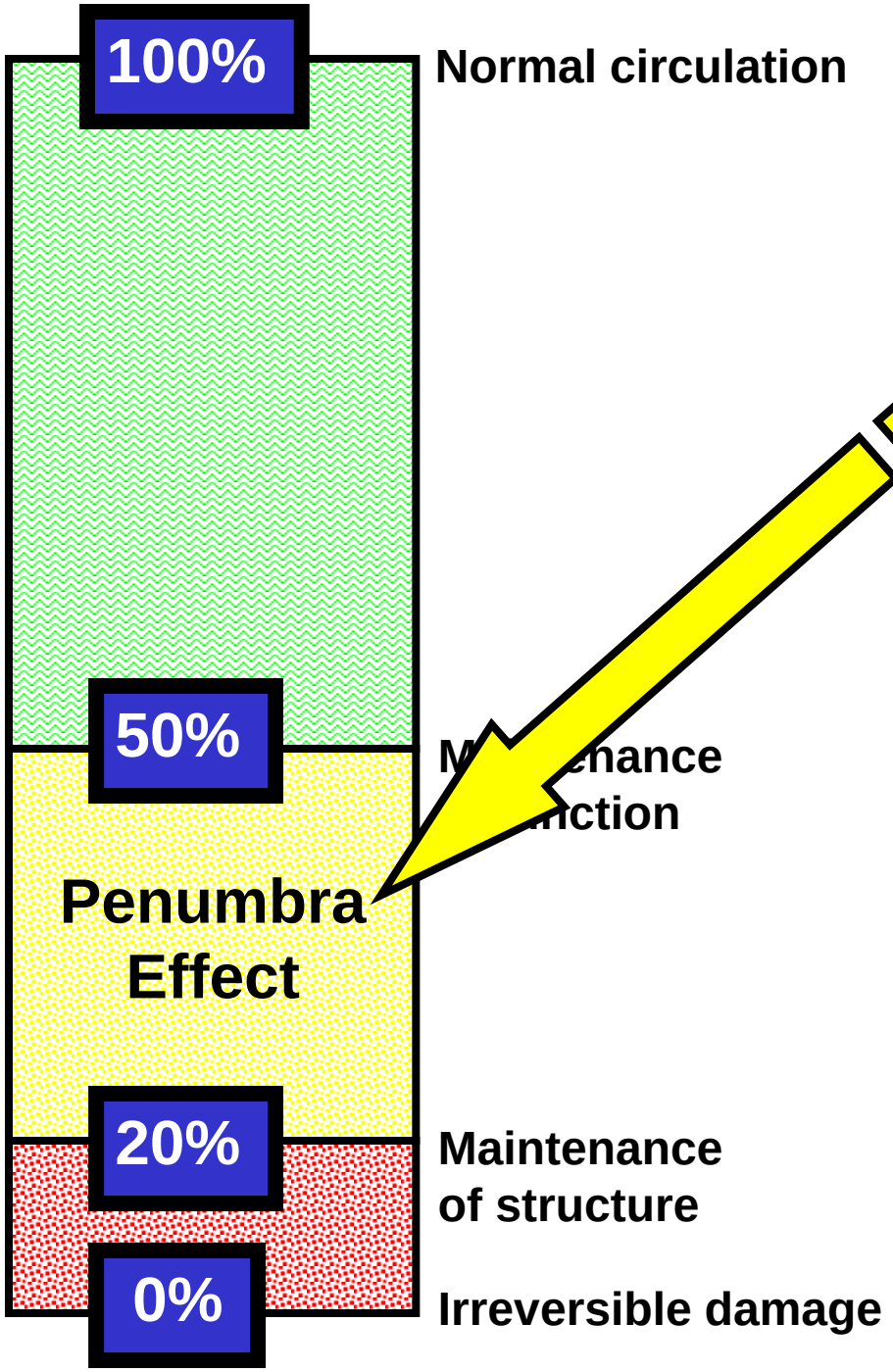


The

PENUMBRA EFFECT

Occurs Between

The

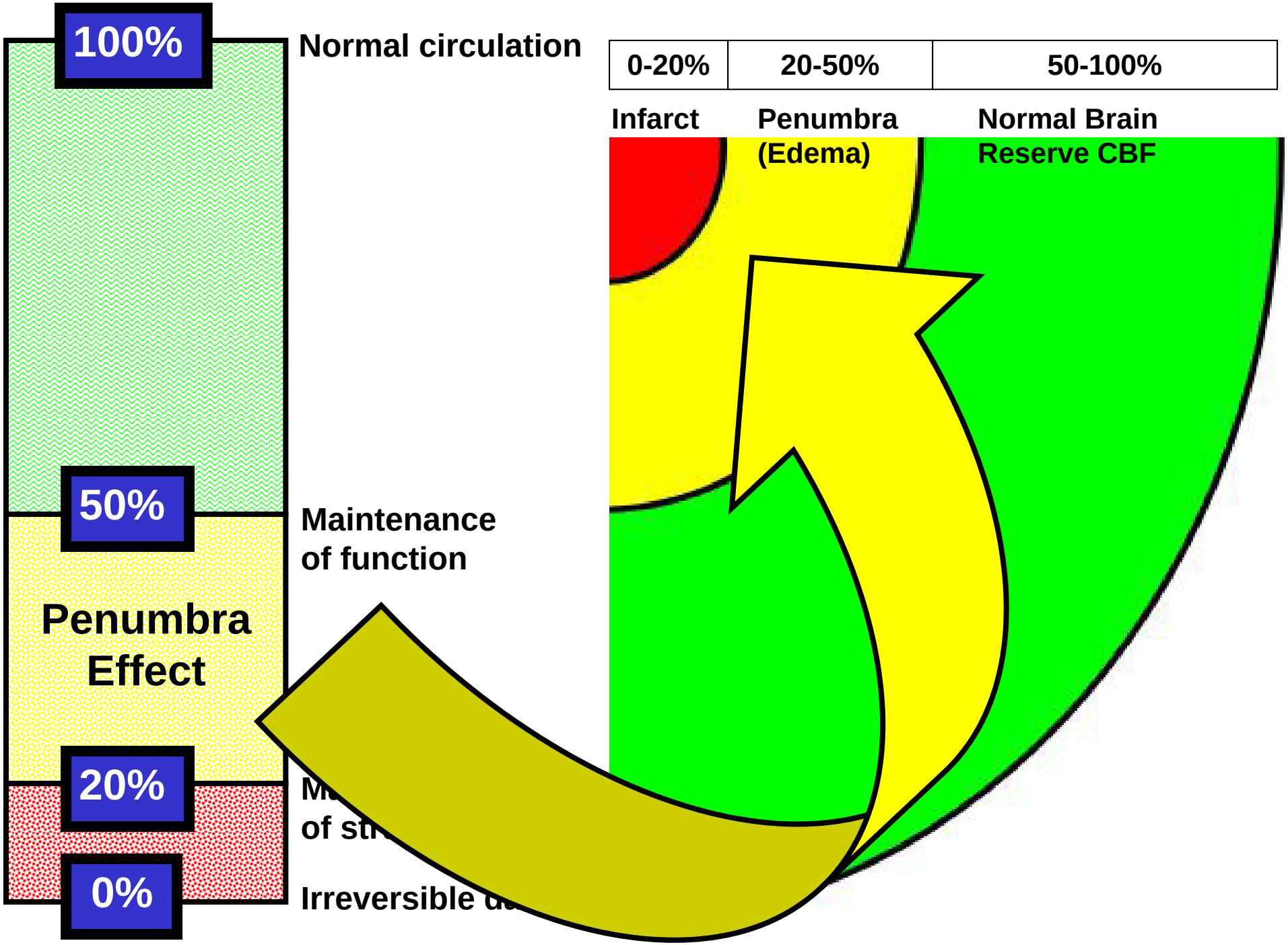
20% To 50%

Range And Is The

Critical Region

For Potential

Healing And Repair


100%
Normal circulation
50%
Maintenance
of function
Penumbra
Effect
20%
0%
0-20%
20-50%
50-100%
Infarct
Penumbra
(Edema)
Normal Brain
Reserve CBF

An Important Distinction For Autism

Oxygen diffusion into tissues

At 1 ATA of room air, capillary pO2 of about 100 mmHg diffuses 64 microns (about the thickness of one sheet of paper) from the functioning capillary

As pO2 increases, oxygen diffusion distance increases

An Important Distinction For Autism

Oxygen diffusion into tissues

At 1 ATA of room air, capillary pO2 of about 100 mmHg diffuses 64 microns (about the thickness of one sheet of paper) from the functioning capillary

As pO2 increases, oxygen diffusion distance increases

An Important Distinction For Autism

Oxygen levels of room air at various tissue levels

Lung aveoli; 21% oxygen; 160 mmHg -->
Lung capillaries; 100 mmHg -->
Aorta as it leaves the heart; 85 mmHg -->Peripheral arterioles; 70 mmHg -->
Organ capillaries; 50 mmHg -->
Cells; 1-10 mmHg -->
Mitochondria; 0.5 mmHg: about 0.3% of O2 in lungs

An Important Distinction For Autism

Localized or avascular lesions,

e.g. stroke or diabetic foot

More pressure is needed to go well beyond 64 microns to oxygenate the tissue that lies deep within the heart of the lesion.

An Important Distinction For Autism

Diffuse lesions, e.g. autism

Though areas of the brain have been shown to have less blood flow in children with autism, “functional but temporarily ‘empty’” capillaries remain in close proximity to each other. It only takes a mild increase in pressure to “push” oxygen molecules back into them. Once the capillaries are again “full” and transporting oxygen, the amount that diffuses into the surrounding cerebral tissue will overlap with their neighboring capillaries and fill the oxygen void.

An Important Distinction For Autism

Diffuse lesions, e.g. autism

Therefore the effect of pressure to increase oxygenation to the brain is less of a factor in autism than it is in patients with focal lesions or vascular lesions, like a stroke or diabetic foot, where pressure gradients must be very high to "drive" the oxygen molecules deeper into tissues to "do the job alone" because there are no overlapping functional capillaries to share the burden of re-oxygenation.

An Important Distinction For Autism

Diffuse lesions, e.g. autism

Cells and the organelles within cells each have a maximum rate at which they can produce cellular or organellular product. It is postulated that children on the autism spectrum have increased mitochondrial “distress”, not disease. Though it is true that increasing the pressure delivers more oxygen to the mitochondria, it is not necessarily true that once oxygen reaches the mitochondria that they can produce “mitochondrial product” beyond their *genetically predetermined maximum rate of production.*

An Important Distinction For Autism

Diffuse lesions, e.g. autism

With rare exceptions, children with autism do not have mitochondrial *disease* though their mitochondria may be *distressed* and not function to optimal capacity. Therefore it is just as plausible that the mitochondria will reach their maximum rate of output with *extra* oxygen while *excess* oxygen will not produce more mitochondrial product per unit time. It *is just as plausible* that working the cells for longer periods of time will produce more mitochondrial product than higher amounts of oxygen for lesser periods of time.

Can “Protocols” Be Compared?

- **Classically taught mechanisms of action (with my comments about oxygen, pressure, and treatment times)**
  - Increases oxygen diffusion distance
    - High pressures and high oxygen concentrations are needed for avascular or poorly vascularized disorders to receive increased amounts of oxygen.
    - Increased treatment time is not advised due to the potential for negative effects from excess oxygen on normal tissue.

Can “Protocols” Be Compared?

- **Classically taught mechanisms of action (with my comments about oxygen, pressure, and treatment times)**
  - Neovascularization and reperfusion
    - High pressures and high oxygen concentrations are needed for avascular or poorly vascularized disorders to receive increased amounts of oxygen.
    - Increased treatment time is not advised due to the potential for negative effects from excess oxygen on normal tissue.

Can “Protocols” Be Compared?

- **Classically taught mechanisms of action (with my comments about oxygen, pressure, and treatment times)**
  - Vasoconstriction; decreases cerebral edema
    - High pressures and high oxygen concentrations are needed for the reflexic vasoconstrictive response which secondarily decreases cerebral edema.
    - Increased treatment time is not advised due to the potential for negative effects from excess oxygen on normal tissue.

Can “Protocols” Be Compared?

- **Classically taught mechanisms of action (with my comments about oxygen, pressure, and treatment times)**
  - Enhances leukocyte oxidative killing activity
    - The maximum or minimum pressure and oxygen concentrations relative to maximum or minimum treatment times need to be studied.
    - Once a leukocyte’s maximum oxidative killing activity is reached, increasing treatment time and/or decreasing oxygen concentration may be a better choice than increasing pressure.
    - The combination of higher than required oxygen and pressure increases the potential negative effects of excess oxygen on normal tissue.

Can “Protocols” Be Compared?

- **Classically taught mechanisms of action (with my comments about oxygen, pressure, and treatment times)**
  - Antibacterial effects (anaerobic bacteria)
    - If the infection is in a deep tissue or one that is poorly vascularized, high pressures and high oxygen concentrations are needed and increased treatment times are contraindicated due to the potential negative effects of excess oxygen on normal tissue.
    - If the infection is in a relatively well vascularized tissue, lesser amounts of pressure and oxygen concentrations may be used so that treatment times may be extended.

Can “Protocols” Be Compared?

- **Classically taught mechanisms of action (with my comments about oxygen, pressure, and treatment times)**
  - Effects the immune system (likely due to changes in cytokine signaling ratios)
    - The maximum or minimum pressure and oxygen concentrations relative to maximum or minimum treatment times need to be studied.
    - Once the immune system’s maximum signaling capacity is reached, increasing treatment time and/or decreasing oxygen concentration may be a better choice than increasing pressure.
    - The combination of higher than required oxygen and pressure increases the potential negative effects of excess oxygen on normal tissue.

PROTOCOLS CAN BE COMPARED

The “Do Nothing” protocol → no chance to win.

The “Do Something” protocol → winning is a definite possibility and the odds are very good~!

TAKE THE STEPS YOUR HEART IS TELLING YOU TO TAKE

The “Do Something” protocol → winning is a definite possibility and the odds are very good~!

!~THANK YOU ~!

TO ALL THE DEDICATED PARENTS
and
AUTISM ONE 2011

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