

# Brain Health 101

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A healthy and mature brain learns, inhibits appropriately, creates beauty, and encourages love. J. K. Rotchford - 2017

## Introduction

A lot of progress has been made in the realm of brain health. Understanding and promoting healthier brains will remain humbling for the foreseeable future. We lack simple and clear biomarkers of brain capacity and function. Furthermore, brain function varies largely over time in the healthiest of brains. The intent here is to promote those ways which we already know can help some, if not all brains to function better. The brain is our most important organ. When it stops functioning we are dead, it's function largely defines us as human beings, and most serious disabilities are associated with brains not working well.

## The Basics of Brain Health

The brain is comprised of living cells and all living cells require food, oxygen, and a means to get rid of the wastes they produce.

1. Food for the brain, metaphorically speaking, involve all human activities and sensory input. For the purposes of this discussion food for the brain refers to the basic building blocks of brains cells. : sugar (glucose), essential fats and amino acids, vitamins, trace elements, hormones, etc.
2. Oxygen is a requirement for all cells in your body to function normally.
3. Brains require sleep. People may actually die if they do not obtain adequate sleep. One may be quite ill even only after several days without adequate sleep.

## The Essentials - Principles & and Factors related to Brain Health

In addition to the above basics there are 5 important principles and factors to address.

1. **Homeostasis** – this simply means that the brain requires everything to be kept in a relatively stable environment. Factors such as temperature, acid/base balance, electrolytes, levels of nutrition and by-products of metabolism are just some of what our brains require to be kept steady and in balance. The intact blood brain barrier is an evolutionary component promoting brain homeostasis.
  - a. Homeostasis, more or less, is a primary attribute of good health. A first step in promoting homeostasis is to limit factors that negatively challenge homeostasis. Non-prioritized examples include:
    - i. Infections

- ii. Cancer and Tumors
- iii. Trauma
- iv. Ongoing Stress and Threats
- v. Hormonal dysregulation
- vi. Sleeping disturbances
- vii. Inflammation
- viii. Oxidative Stress
- ix. Environmental toxins and stressors
- x. Withdrawal from certain substances, environments, and behaviors.
- xi. Etc.

2. **Exercise** – As much as any organ the brain requires healthy physical exercise and usage.

Ongoing learning and use of the brain promote healthier brains. Indeed, “exercising” the brain through activities such as meditation is associated with more robust brain cells. New research even shows that a decline in hearing can be related to progress toward dementia. If we don’t hear, we can’t listen so the brain’s activities associated with hearing decline. The result can be a gentle slope toward dementia.

a. In general, ensuring adequate levels of aerobic and even resistant and neurotonic (eg: yoga, tai qi etc.) exercise each and every day can be the most important intervention one can take to preserve and optimize brain health.

3. **Adequate circulation** – Blood circulation is a topic of its own because blood delivers essential nutrients and eliminates waste. Without receiving adequate blood the brain cells die. This is what happens with strokes, serious heart arrhythmias, and heart attacks. Unhealthy blood vessels can clearly compromise brain function.

4. **A little bit of this and a little bit of that** – In our western way of thinking, particularly as it relates to standard research, we are looking for specific variables that influence an organ’s health. The Chinese and other observers have known for millennia that a little bit of this and a little bit of that might be safer and more effective than a lot of this or a lot of that. This is often particularly true when it comes to promoting brain health. Indeed, the understanding of the importance of addressing multiple factors at the same time is the subject of a landmark paper. It addresses the question of how to help those who are experiencing declines in memory. The full article is online and the link is: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4221920/>

5. Love, meaning, and social support along with all of the other factors associated with well-being are associated with brain health. Feelings of safety and gratitude are important and often overlooked when attempting to help brains function better.

a. Please refer to the article: [Want lasting Happiness? Get religion](#). The study suggests that there is objective evidence that religion can help brains function better and experience less depression.

b. Ted Talk on predictors of happiness:

i. [Dan Gilbert](#)

ii. Robert Waldinger, M.D. [What makes a good life? Lessons from the longest study on happiness--](#)

# Yikes, this seems a bit too much to take in

It is agreed that coming up with an optimal plan for brain health can be complex and generally benefits from careful planning and persistence. Plans are best individualized based on medical history and one's current clinical findings. The following are principles to help guide one in planning. The ancient Greeks knew: *one man's poison is another's food*. As a result there are relatively few suggestions that will work for everyone.

## **There are, however, some sound general principles to guide brain health plans.**

1. **Eliminate poisons or toxins** – Common sense says that when promoting health a good starting point is to eliminate poisons and toxins whenever possible
  - a. In the American culture excess sugar, alcohol and tobacco are arguably at the top of common toxins, particularly when they are used to excess and over extended periods.
  - b. Certain brain toxins and poisons stem from other organs not working . For example there is good evidence that when one's liver, colon, kidney, or other essential organs are not healthy, there can be a buildup of toxic compounds that are harmful to the brain's function.
  - c. There are some relatively rare toxins such as lead, mercury, etc. which some people may have been exposed to. If these toxins can be identified it makes sense to help the body "detoxify".
  - d. Some could argue that certain diets and environments are toxic to the brain.
  - e. Etc.
2. **Diagnose and treat diseases that interfere with proper brain function.** Whether it is an overt brain disease associated with a serious infection or trauma, or perhaps less obvious as in depression, PTSD, chronic pain, substance use disorders, etc., diseases that are not adequately treated often stress brains.
3. **Assure adequate oxygen and nutrition for the brain.** Compared with other organs the brain requires much more energy and nutrients to function properly.
  - a. Some blood work is generally indicated to look for common or not so common deficiencies.
  - b. Sleep apnea and other conditions which interfere with the brain getting adequate oxygenation must be recognized and treated.
  - c. Adequate sleep must be assured.
4. **Promote a sense of safety and limit real or even imagined threats** - All natural healing and functioning occur in the context of relative stability, that is, a context associated with *feeling safe*. While there are some superstar athletes whose brains seem to function best when stress is high, their brains too will start to function poorly if the stress is maintained over extended periods. Most brains demonstrably suffer when stress is high or maintained without rest.
  - a. Spiritual and healthy social communities can be very helpful to produce a sense of safety.
  - b. If pain is present, proper pain management becomes essential.
  - c. Stabilization of blood levels of blood sugar, medications, etc. help prevent significant ups and downs that interfere with brain homeostasis.
  - d. Have fun regularly. A healthy brain enjoys and promotes fun. Vice versa regular fun helps brains. This correlates with the "fake it until you make it principle". Brains adapt and change based on conditioned patterns.
5. Help promote better health in the people around you. We often overlook how important our environment is. The Chinese medical model even has a "specialty" associated with environmental factors. It is

called Feng Shui. I think the most important variable of our surroundings is the health and vitality of the people who directly and even indirectly are part of our closer and extended communities.

6. Be willing to ask for help and input. Often behavioral changes benefit from regular accountability, as well as coaching. Along these lines a regular evaluation and follow up from a physician, sensitive to comprehensive health, is a good bet.

## For you and your physician(s) working together

The following is clinical checklist to better assure brain health - this includes a list of diagnostic testing or supplements that can be helpful in optimizing brain health. It is not comprehensive and it is best always individualized by your physician.

1. Diagnose and effectively address diseases associated with poor brain function:
  - a. Sleep Apnea, Chronic Pain, Substance Use Disorders, Depression, and PTSD, are common in specialized practices of Pain Management, and Addiction Medicine. All chronic diseases and their treatments may and often do influence brain function.
  - b. General exam, history, and blood work looking for the most common diseases. One's primary care provider is generally the one who provides the basic services.
2. Diagnose & treat potential nutritional deficits:
  - a. Omega 3's, Vitamin D, B-12, Folate, Pantothenic Acid, Thiamine, Zinc, Free Copper, Magnesium, Selenium, Manganese, and homocysteine >8, are perhaps the more common blood tests or nutritional status items likely to make a difference. (Optimized Cu/Zn ratio is approximately 0.7-1.0)
3. Diagnose & Treat Hormonal Imbalances:
  - a. Free Testosterone, Progesterone, Estradiol, Pregnenolone, DHEA-S, ACTH, Cortisol, TSH, FT4, FT3 are all worth considering. Also fasting insulin <7 along with Glycosylated Hgb < 5.5. (Some of the above tests require early morning blood draws)
4. Diagnose & Treat Inflammatory States:
  - a. C- Reactive Protein, Serum Albumin/Serum Globulin ratio > 1.5.
5. Consider heavy metal toxicity: Pb, Hg, Cd (cadmium)
6. Provide adequate anti-oxidants such as glutathione or its precursors. Taurine 500 mg tid has been shown to grow new brain cells.
7. L-arginine and or Nattokinase to promote blood circulation and limit clotting.

## **What might your own brain health checklist comprise? - Items any individual can do with or without the help of a physician.**

1. “Take it easy,” “easy does it,” “it takes time,” and “progress not perfection” are all familiar slogans in recovery programs. These slogans are here because they remind us that long term behavioral changes often require persistence and benefit from ongoing support.
2. The brain likes routines. Similar times to go to bed, wake up, eat, exercise, work, play, take medicines, supplements, etc. can all be very helpful. Introduce routine fasts for 12 hours each night, including a 3-hour fast prior to bedtime.
  - a. Chinese medicine and other alternative forms of medicine have a long tradition of promoting balance and proper movement within the body. If resources permit, proper herbal support and acupuncture can be quite helpful to promote healthy homeostasis and stress reduction.
3. Make good sleep a priority. If simple sleep hygiene techniques do not work, seek help and supplements such as melatonin, theanine or tryptophan. In some cases medications may be helpful.
4. Exercise for at least 45 minutes or more three times a week. Gradually work up to higher exercise levels when possible. Walking is a very good natural exercise. However, other forms of aerobic exercise such as swimming, bicycling, and dancing, are considered the best.
5. Healthy diets: Patients have the choice of several low glycemic, low inflammatory, low grain diets. Mediterranean diets are generally good and avoid more than one serving or so of alcohol in any one day. All of us should consume less alcohol as we get older. Women in general are more sensitive. Seek help for any tobacco or other substance use disorder.
6. If your daily activities do not provide for adequate brain stimulation, there are online and other activities to consider such as “Brain Exercises That Work” at [BrainHQ.com](http://BrainHQ.com) , “Brain Training” at [Luminosity.com](http://Luminosity.com), and others.
7. Be more social. Assure that you take steps to avoid isolation. Church, service organizations, ongoing education, along with work, exercise, or fun with others are all possibilities.
8. Seek and obtain a comprehensive medical evaluation to help assure that an identifiable disease process or basic nutrient deficiencies are addressed.
9. Obtain professional support or input regarding an appropriate and individualized nutritional support program.
10. Stress reduction strategies: Personalized ones work best — yoga, meditation, music, prayer, Tai Chi, massage, soaks, floating, acupuncture, and psychological/behavioral therapies are all options. Realize that obtaining outside support/input for situational stressors can be very helpful.

## **Brain Health 100 Checklist - A “simplified” two part checklist for your brain health plan**

The reasons for the following suggestions are provided above. See below for pertinent references.

**Introduction:** The following checklist is a start of items you might consider as being part of your formal brain health plan. Rather than attempt to do everything on the list we suggest 5 or 6 new items to add to your current plan. Based on your progress after a month or so you can slowly add items to see which ones make a difference. After trying 5 or 6 new things and finding little help, it is best to add more items to your plan rather than replace items. If the evidence is clear that your brain health has improved significantly and you are happy with same, then you can start to slowly eliminate some items one by one. Through this process you might discover which combination appears to be most helpful. The good news is that, when brains function better, we generally feel better. We recommend getting some professional input during the process. Taking baseline and follow up memory tests and and tests or formal measurements of pain levels, mood, etc. are readily available and most often free. Test your ability to balance on one leg. These sorts of testing can act as indirect measures of brain function.

## A. Medical Evaluation Checklist for Brain Health

The following is a checklist of items you can provide to your physician to help assure that a comprehensive medical evaluation is part of your plan for better brain health.

Please visit: [www.opas.us](http://www.opas.us)

**Under the “Handouts” tab and the Brain Health Section** you can find **Brain Health 101**. Therein is a more thorough review of supplements, behavioral tools, and other means to promote good brain health.

### Comprehensive Medical Evaluation

- a. **Medical History**
- b. **Yearly Physical Exam**
- c. **Chemistry Laboratory Evaluations**  Ideally, your physician would base tests on your medical history and exam and as a result better predict which concerns are more likely to influence brain health.
  - i. CBC
  - ii. General Metabolic Screen
  - iii. Vitamins and Minerals (Vitamin D\*, B-12\*, Folate\*, Pantothenic Acid, Thiamine, Calcium\*, Zinc\*, Free Copper\*, FCu/Zinc Ratio, Magnesium\*, Selenium, Manganese), Iron levels (Ferritin levels over 100)
  - iv. Metabolic Disorders (Glycohemoglobin <5.5, Fasting Insulin <7, homocysteine <8, ferritin, early am cortisol levels)
  - v. Toxic Substances: (Urine Etg & Creatinine, Urine Drugs of abuse, Serum Cotinine, Pb, Hg, Cd)
  - vi. Markers of inflammation: (C- Reactive Protein or Sed Rate, Serum, Albumin/Serum Globulin ratio > 1.5., IgAtTG: Immunoglobulin A (IgA) anti-tissue transglutaminase (tTG) antibody; cytokines (interleukin and TNF) Total serum IgA, Hepatitis C antibody)
  - vii. Hormone Balance (TSH, fT3, fT4, Estradiol, Testosterone, progesterone, pregnenolone, DHEA-S, ACTH, cortisol) Samples best drawn early in AM.)

Restoration Hormone Levels in Men: DHEA-s: 350-490 µg/dL; Estradiol: 20-30 pg/mL; Total Testosterone: 700-900 ng/dL Free Testosterone: 20-25 pg/mL

Restoration Hormone Levels in Women: Estradiol: 90-211 pg/mL; Progesterone: 2.0-6.0 ng/mL; Free testosterone: 1.0-2.2 pg/mL

## **B. A Patient's Checklist for other potential suggestions to improve Brain Health**

1. Diet Changes: Less than 2 drinks/day of alcohol for men and one or fewer drinks of alcohol for women, low glycemic & low inflammatory diet, regular meals earlier in day, fast 12 hr. each night, including 3 hr prior to bedtime, fewer refined carbohydrates, more fruits and vegetables.
2. Supplements: (Note, because a supplement is not on this list doesn't mean it might not be quite helpful for your particular needs. Here again is a case where your physician, pharmacist, or naturopathic physician could help guide you.
  - a. Vitamins/Supplements: Vitamin D3 10,000 units/day for 50-100 days, Vitamin K2, Me-B12, MTHF, pantothenic acid, pyridoxal-5-phosphate; TMG, trimethylglycine if necessary, and others as indicated. Taurine 500 mg TID has been shown to grow brain cells. If circulatory issues are likely consider L-Arginine supplementation as a precursor for nitrous oxide and improved vascular endothelial function
  - b. Fats and Fatty Acids: Omega 3 Fatty Acid supplementation (Up to 3,000mg/day), Coconut oil or Axona, Evening Primrose oil.
  - c. Mitochondrial Support: CoQ or ubiquinol,  $\alpha$ -lipoic acid, PQQ Pyrrloquinoline; NAC n-acetyl-cysteine; ALCAR acetyl-L-carnitine; Se, Zn, resveratrol, ascorbate, thiamine
  - d. Reduce Alpha beta: Curcumin, Ashwagandha
  - e. Cognitive Enhancement: Bacopa monniera, magnesium threonate have references. Chinese Medicine support related to proper blood circulation, kidney function and balance, assimilation, detoxification, and overall balance are likely to be helpful.
  - f. Increase Neurotrophic Growth Hormone NGF: H. erinaceus or ALCAR acetyl-L-carnitine
  - g. Provide synaptic structural components: citicoline, DHA
  - h. Antioxidants: Mixed tocopherols and tocotrienols, Se, blueberries, NAC, ascorbate,  $\alpha$ -lipoic acid. The mother of all antioxidants, glutathione, is produced by your body; to effectively supplement it a prescription is needed and nasal administration is best. Precursors of glutathione likely work best to improve glutathione levels in the brain.
  - i. Increase SirT1 function: Resveratrol
  - j. Modulate Glial Cell function: Low dose naltexone; metformin; acetazolamide; peentoxyfylline;
  - k. Others as indicated
- i. Digestive Aids may help if evidence for poor assimilation.
3. Gastrointestinal and Colon Health
  - a. Repair if needed; Reference: prebiotics and probiotics Practical Suggestions: Probiotics Discussion from Health Radar Newsletter
4. Physical Exercise
5. Brain Exercises
6. Introduce Regular Stress reducers

7. Assure good sleep 
  - a. Sleep Apnea Screening
  - b. 8 hr sleep per night; melatonin 0.5mg po qhs; Tryptophan 500mg po 3x/wk if awakening.
8. Increase social activities
9. Add more structure and routine into your daily activities.
  - a. Regular times to get up, go to bed, eat, exercise, work, play, pray, meditate, etc.
10. Introduce some accountability into your plan. Reinforcement loops help within the brain and external loops assist same.

Remember: *Progress not Perfection!!*

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<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4221920/pdf/aging-06-707.pdf>

2. Life Extension website is [lef.org](http://www.lef.org). The following link supports the above premises and recommendations. Multiple references present. Perhaps not obvious to some but apparent when one thinks about it: Life extension is primarily about good brain health!

<http://www.lef.org/Magazine/2015/2/Combat-Age-Related-Brain-Atrophy/Page-01>

The following is taken from the above referenced article: Reversal of cognitive decline: A novel therapeutic program.

3. A number of articles related to preserving brain health and avoiding alzheimers published through the Brain Health association. [Pdfs and docs](#) In particular the following reference guide is taken from a [published article assessing options for reducing cognitive decline](#).

Goal	Approach	Rationale and ences
Optimize diet: minimize CHO, minimize nation.	Patients given choice of several cemic, low inflammatory, low iets.	Minimize nation, minimize resistance.
Enhance autophagy, nesis	Fast 12 hr. each night, including 3 r to bedtime.	Reduce insulin reduce A $\beta$ .
Reduce stress	Personalized—yoga or tion or music, etc.	Reduction of l, CRF, stress axis.
Optimize sleep	8 hr sleep per night; melatonin po qhs; Trp 500mg po 3x/wk if ning. Exclude sleep apnea.	[36]
Exercise	30-60’ per day, 4-6 days/wk	[37, 38]
Brain stimulation	Posit or related	[39]

Homocysteine <7	Me-B12, MTHF, P5P; TMG if ary	[40]
Serum B12 >500	Me-B12	[41]
CRP <1.0; A/G >1.5	Anti-inflammatory diet; in; DHA/EPA; optimize hygiene	Critical role of nation in AD
Fasting insulin <7; c <5.5	Diet as above	Type II diabetes-AD rship
Hormone balance	Optimize ft3, ft4, E2, T, terone, pregnenolone, cortisol	[5, 42]
GI health	Repair if needed; prebiotics and otics	Avoid inflammation, munity
Reduction of A-beta	Curcumin, Ashwagandha	43-45
Cognitive enhancement	Bacopa monniera, MgT	[46, 47]
25OH-D3 = 50-100ng/ml	Vitamins D3, K2	[48]
Increase NGF	H. erinaceus or ALCAR	[49, 50]
Provide synaptic ral components	Citicoline, DHA	[51].
Optimize antioxidants	Mixed tocopherols and enols, Se, blueberries, NAC, ate, $\alpha$ -lipoic acid	[52]
Optimize Zn:Cu ratio	Depends on values obtained	[53]
Ensure nocturnal ation	Exclude or treat sleep apnea	[54]
Optimize mitochondrial n	CoQ or ubiquinol, $\alpha$ -lipoic acid, IAC, ALCAR, Se, Zn, resveratrol, ate, thiamine	[55]

Increase focus	Pantothenic acid	Acetylcholine sis requirement
Increase SirT1 function	Resveratrol	[32]
Exclude heavy metal	Evaluate Hg, Pb, Cd; chelate if ed	CNS effects of heavy
MCT effects	Coconut oil or Axona	[56]

Key to above abbreviations:

CHO, carbohydrates; Hg, mercury; Pb, lead; Cd, cadmium; MCT, medium chain triglycerides; PQQ, polyquinoline quinone; NAC, N-acetyl cysteine; CoQ, coenzyme Q; ALCAR, acetyl-L-carnitine; DHA, docosahexaenoic acid; MgT, magnesium threonate; fT3, free triiodothyronine; fT4, free thyroxine; E2, estradiol; T, testosterone; Me-B12, methylcobalamin; MTHF, methyltetrahydrofolate; P5P, pyridoxal-5-phosphate; TMG, trimethylglycine; Trp, tryptophan

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## Further Potential References

This document is a publication of Olympas Medical Services (OMS), J. Kimber Rotchford, M.D., specialist in Pain Management and Addiction, 1136 Water St., Suite 107, Port Townsend, WA 98368 USA. Telephone 360-385-4843. Other helpful handouts related to brain health can be found at [www.opas.us/handouts](http://www.opas.us/handouts)

Daniel G. Amen has put together a lot books, courses, blogs, etc. directed at better brain health. His suggestions echo the above and may provide a more “digestible” and expanded format than provided here. One of his websites is: [12 Prescriptions for Creating A Brain Healthy Life](#)

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