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Date of Assessment: 10/25/17

Lab Processing Date: 11/1/17

Barcode ID: HCP-11303

Patient ID: 17739-JD-01

BrainSpan™ Cell Health Assessment

All diseases are disturbances at the cellular level. To treat disease, we must understand its cause. To understand the cause of a disease, we must understand the alterations that occur at the level of individual cells. – Yale School of Medicine

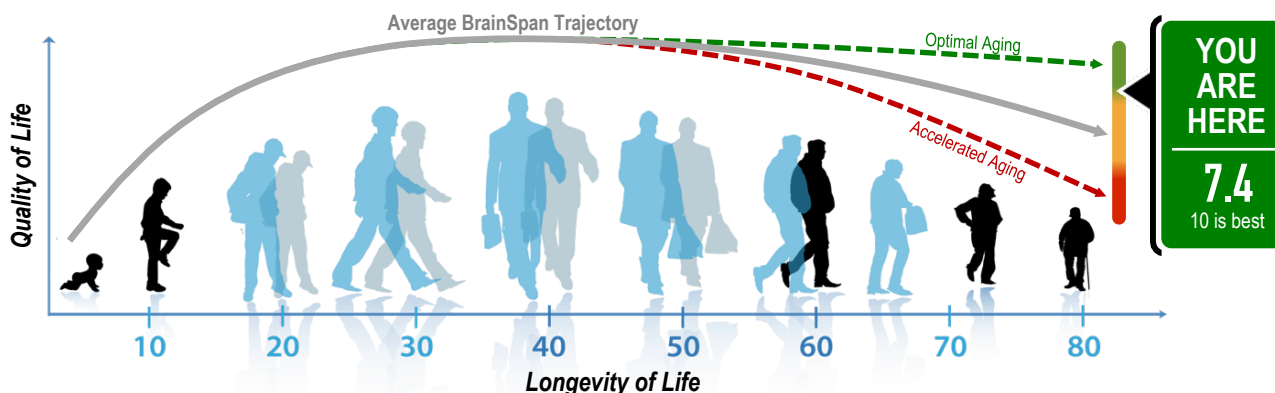
Your BrainSpan results provide you with some of the most important numbers in determining the health of your cells. The health of your cells dictate the health and function of your entire brain and body. This report quantifies specific nutrients in your cells called essential fatty acids (EFAs). These fatty acids have many important roles in protecting and optimizing the health of your brain and body. Your brain is 60% fat and most of that is from an Omega-3 fatty acid called DHA. DHA promotes new neuron growth – a process called neurogenesis that should continue throughout adulthood. Omega-3 and Omega-6 fatty acids also regulate your metabolism and inflammation throughout your body.

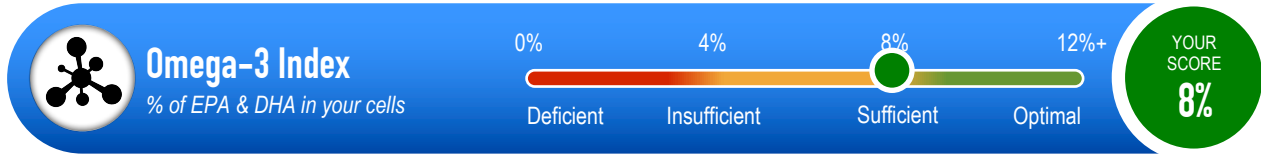
Most Americans have major imbalances driven by dietary, genetic, and cultural factors. These imbalances largely go unrecognized and increase your risk of many preventable chronic diseases such as dementia and heart disease. A recent study by Harvard School of Public Health linked these fatty acid imbalances to over 50 diseases contributing to 96,000 preventable deaths per year. Without measuring and tracking, you are in the dark when it comes to the health of your cells – the foundational building blocks of your entire brain and body.

Additionally, this assessment measures the functional performance of your brain cells (neurons). You performed several cognitive challenges that compared your memory, attention, and processing speed to a carefully screened control group of your same age and gender using the *Brain Resource International Database®* (the world's largest, standardized, normative brain health database). This provides you with a brain function baseline. Tracking your scores annually can provide you with early detection of small changes that may be quickly improved with nutritional and lifestyle interventions.

Your BrainSpan Trajectory Index*

*Your BrainSpan Trajectory Index is based on the results from your blood cell test and brain function assessment. Each score in this report has been weighted based on relevant scientific literature regarding age-related cell degeneration and cognitive decline. Research shows that maintaining your scores in the "green zone" lowers your risk of cognitive decline and helps prevent chronic inflammatory diseases like Alzheimer's Disease and heart disease.





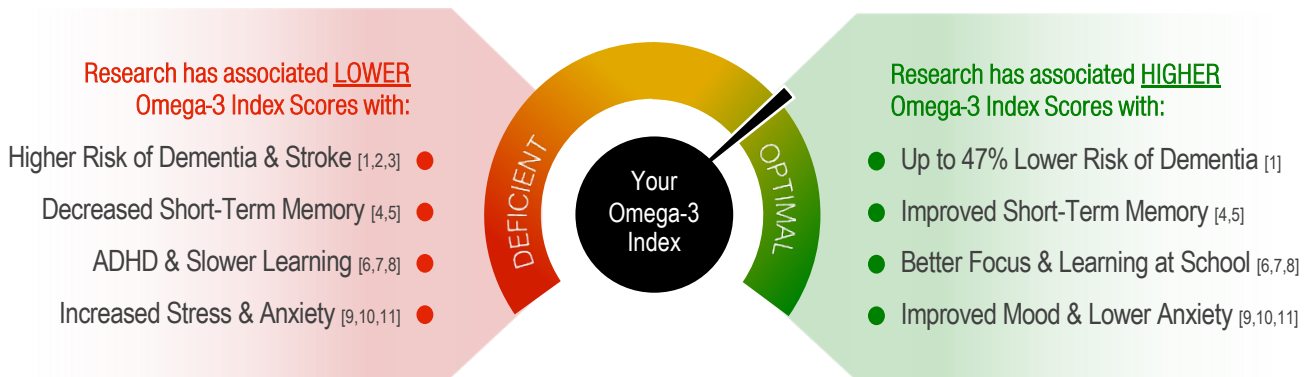
YOUR OMEGA-3 INDEX:

The human brain is nearly 60 percent fat with the majority being Omega-3 fatty acids. These are the building blocks of the brain and are crucial molecules that determine the brain's integrity and ability to perform. Omega-3s cannot be made by your body, so it is critical to obtain them by eating fish or taking fish oil. However, when it comes to Omega-3s, the most important factor is how much is being absorbed by your blood cells.

Consistently measuring your Omega-3 Index is the only way to maintain optimal levels. An Omega-3 Index over 8% is associated with improved memory, attention, learning, mood stability, faster recovery from concussion as well as lower anxiety, depression, and inflammation. Additionally, tracking your Omega-3 Index over time is one of the most important ways to help prevent alzheimer's disease, cognitive decline, and cardiovascular disease. Omega-3s are to your brain cells what calcium is to your bones; or what protein is to your muscles.

RESEARCH & ASSOCIATED CONDITIONS:


The graph below shows how your Omega-3 Index compares to current research studies.



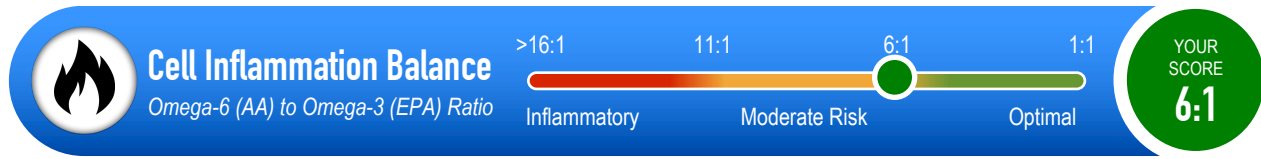
PERSONALIZED RECOMMENDATIONS:
To achieve an Omega-3 Index above 8% within 3 months, you will need to do one of the following:


Eat a 3 oz. serving of oily fish (Salmon, Herring, Bluefin) at least 4 times per week to maintain in the "green zone"

or


To maintain your Omega-3 Index in the "green zone", take 1,000 milligrams of combined EPA & DHA per day

Ask your doctor to recommend a quality Omega-3 supplement that has demonstrated a high level of cellular absorption. The most important factor is how much EPA and DHA is absorbed into your blood cells. How it gets there (fish or supplements) really doesn't matter, as long as its absorbed. ONLY choose high quality Omega-3 supplements with both EPA & DHA (from fish). Omega-3 supplements with ALA (from plants) will have little effect improving your cell health or your Omega-3 Index. See Appendix A of this report for information on how to choose quality Omega-3 supplements.



YOUR CELL INFLAMMATION BALANCE:

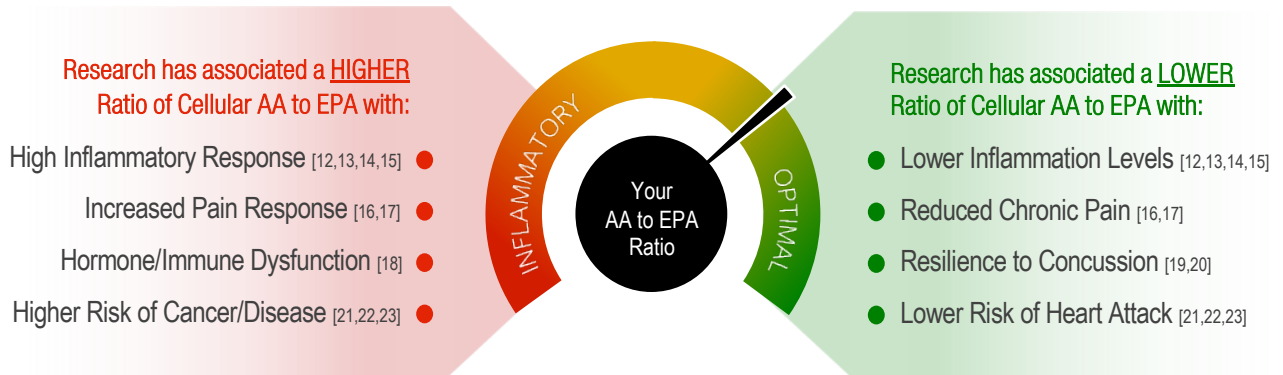
The majority of people in the United States have major imbalances in fatty acids due to the way we eat and grow our food. We have a significant deficiency of Omega-3s (from fish) in our diet and a significant excess of Omega-6s (from corn, soy, vegetable oils, and processed foods).

The fatty acids in your cell membrane are a reflection of the average fatty acids in your diet over the last 90 days. However, Omega-6s tend to increase inflammation whereas Omega-3s tend to decrease inflammation. Balancing these fatty acids is foundational to properly regulating your body's inflammatory response.

Everyone should track their dietary balance of pro-inflammatory Omega-6s to anti-inflammatory Omega-3s. A ratio of 6 or less Omega-6s to every 1 Omega-3 is essential to properly balancing inflammation, modulating pain receptors, and regulating immune system function.





RESEARCH & ASSOCIATED CONDITIONS:

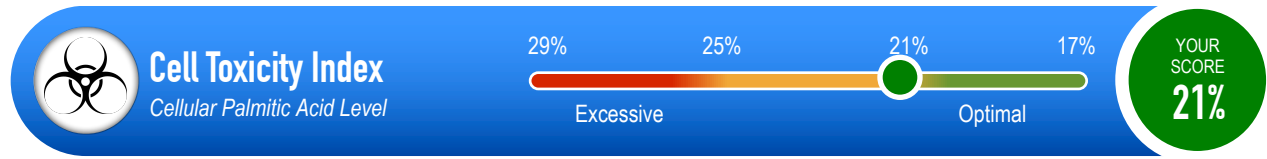
The graph below shows how your AA (Omega-6) to EPA (Omega-3) Ratio compares to current research studies.



RECOMMENDATIONS:

To Improve your Cell Inflammation Index within 3 months, you will need to do the following:

| | | | |
|---|---|--|---|
|  <p>Nutritional supplements like boswellia serrata and curcumin inhibit Omega-6 inflammatory pathways and help balance inflammation.</p> |  <p>Processed foods are high in pro-inflammatory Omega-6s. Reducing these foods will help balance your inflammation ratio.</p> |  <p>Grass fed meat is higher in Omega-3s. Grain fed meat is high in Omega-6s. Eating grass fed meat will improve your ratio.</p> |  <p>Replace commonly used vegetable oils with healthier alternatives such as olive, macadamia nut, or high oleic sunflower oils.</p> |
|---|---|--|---|



YOUR CELL TOXICITY INDEX:

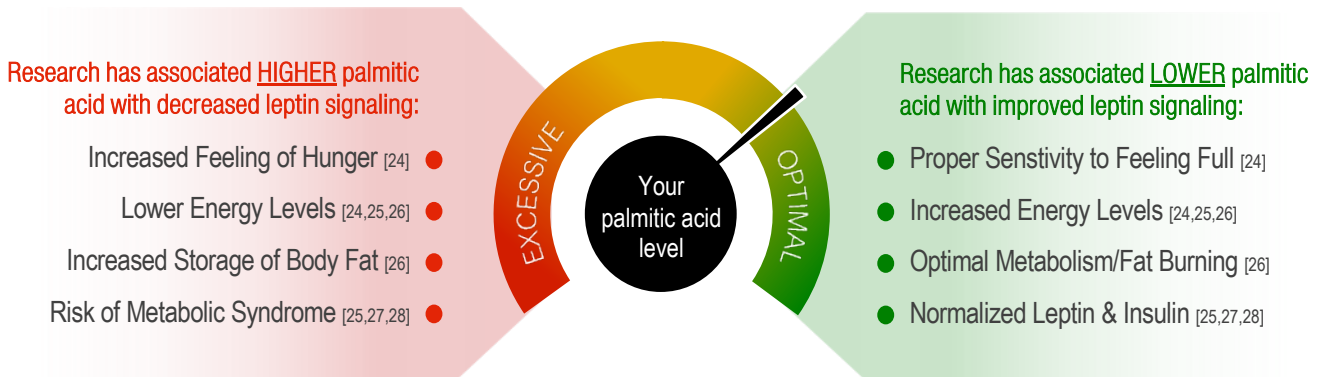
Excessive palmitic acid (usually from a diet high in simple carbohydrates) is associated with fatty acid alterations within the cell that can suppress the proper signaling of hormones critical to proper cell-to-cell signaling. Maintaining optimal palmitic acid levels helps normalize leptin and insulin signaling, which helps regulate your metabolism, increases your energy, and improves neurotransmitter communication.

Your brain communicates with your fat cells throughout your body using leptin signaling. Similar to how a thermostat turns on and off the air to keep the temperature in your house stable, leptin communicates to your cells to burn or store fat.

When proper leptin signaling occurs, the brain properly stimulates a feeling of “full”, increases energy, and starts burning body fat. When leptin signaling is suppressed, the brain stays in “hungry” mode, lowers energy output, and stores body fat.

RESEARCH & ASSOCIATED CONDITIONS:

The graph below shows how your palmitic acid level may be affecting your leptin signaling.



RECOMMENDATIONS:
To Improve your Cell Toxicity Index within 3 months, you will need to do the following:

| | | | |
|---|--|---|--|
|  <p>Supplements such as coenzyme Q10 & chromium encourage healthy blood sugar by improving carbohydrate metabolism</p> |  <p>Reduce your consumption of simple carbs (sugars) so they don't convert to palmitic acid and store up in your cells.</p> |  <p>Eat smaller, low glycemic, high protein meals more frequently throughout the day to stabilize your blood sugar production.</p> |  <p>Increase exercise so that your body uses more calories and does not convert as much glucose to palmitic acid for storage.</p> |
|---|--|---|--|



What This Score Means to You

On the memory capacity test, you scored a 7 out of 10 based on your age and gender. This is considered to be in the EXPECTED range.

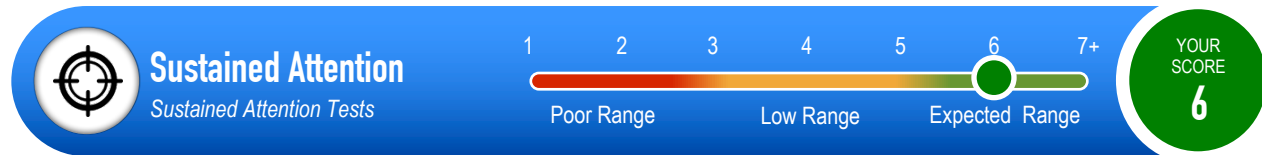
Working memory is the process whereby your brain is able to temporarily store information in the moment and recall it when you need it.

Poor working memory may be associated with nutritional deficits in the cells of the hippocampus – the part of the brain that stores memories.

Poor working memory scores may suggest brain cell nutrient deficiencies, inflammation, insufficient neuronal connections, or poor quality sleep.

How to Improve Your Memory Capacity

- ✓ Getting all three of your blood cell biomarkers into the green zone can optimize your working memory.
- ✓ Phosphatidylserine has been shown to enhance memory for words, faces, names, and numbers, and supports brain health across the lifespan.
- ✓ Quality sleep is necessary to consolidate memories so that they can be recalled in the future.
- ✓ Vitamin D – research shows that memory declines up to 300% faster in individuals with low levels of vitamin D. Only use a quality supplement with high cellular absorption.
- ✓ Aerobic exercise has been shown to boost the size of the hippocampus, the brain area involved in memory.
- ✓ Sage is excellent for better brain functioning and boosting memory recall.



What This Score Means to You

On the sustained attention test, you scored a 6 out of 10 based on your age and gender. This is considered to be in the EXPECTED range.

To efficiently sustain your attention and 'tune out' competing distractions, your brain must produce specific neurotransmitters. However, your brain requires adequate nutrients to create these neurotransmitters.

Attentional problems may be associated with deficiencies in the pre-frontal region of the brain, which controls selective attention, impulsivity, and motivation. These impairments may be caused from nutrient deficiencies, stress, or inflammation.

How to Improve Your Sustained Attention

- ✓ Getting all three of your blood cell biomarkers into the green zone can optimize your sustained attention.
- ✓ Consume a good amount of protein each day. Proteins contain the amino acids that your brain needs in order to create dopamine and improve attention.
- ✓ Vitamin B6 with Magnesium supports attention by helping your brain cells to produce key neurotransmitters vital to sustaining attention.
- ✓ Sleep quality and quantity is essential to sustained attention.
- ✓ Zinc provides the brain with antioxidant protection and helps produce the sleep hormone melatonin. Zinc has consistently enhanced attention and behavior in clinical trials.
- ✓ Cinnamon has been shown to help attention and it helps regulate blood sugar.



What This Score Means to You

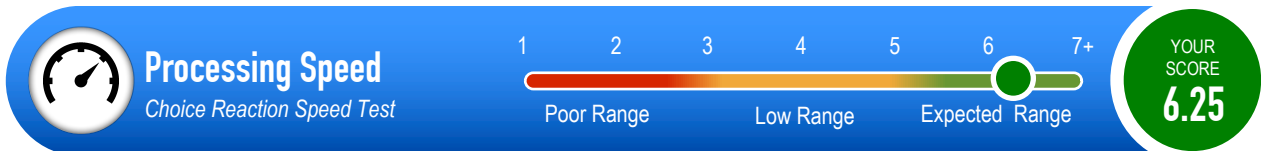
On the cognitive flexibility test, you scored a 6.5 out of 10 based on your age and gender. This is considered to be in the EXPECTED range.

Cognitive flexibility is your capacity to rapidly adapt your thinking based on new information and not get stuck in compulsive behavior. Your brain must be able to reorganize itself by forming new neural connections.

Poor cognitive flexibility scores may be due to a decreased production of the neurotransmitters serotonin and GABA.

How to Improve Cognitive Flexibility

- ✓ Getting all three of your blood cell biomarkers into the green zone can optimize your cognitive flexibility.
- ✓ Meditation – research has shown that mindfulness meditation can significantly enhance cognitive flexibility.
- ✓ Probiotics support gut microbiome function and optimize the production of neurotransmitters Serotonin and GABA, which help support cognitive flexibility.
- ✓ 5-HTP is a metabolite naturally made in the brain, is converted to serotonin as needed to promote positive mood, relaxation, and quality sleep.
- ✓ Vitamin B12 with Folate is essential for structural integrity of the brain and spinal cord. They produce neurotransmitters and key enzymes that improve overall cognitive skills.



What This Score Means to You

On the processing speed test, you scored a 6.3 out of 10 based on your age and gender. This is considered to be in the EXPECTED range.

Processing speed is the pace at which you take in information, make sense of it and begin to respond. It has nothing to do with how smart you are -- just how fast you can take in and use information.

Slow processing speed is associated with inefficient connections in the brain's gray matter. These weak connections may be due to nutrient deficiencies in brain cells, limited production of vital neurotransmitters, chronic stress, lack of quality sleep, and toxins in your diet (such as refined sugars and processed foods).

How to Improve Processing Speed

- ✓ Getting all three of your blood cell biomarkers into the green zone can optimize your processing speed.
- ✓ Curcumin (Turmeric) keeps your brain sharp under pressure. It has also been shown to decrease plaques in the brain linked to Alzheimer's disease.
- ✓ Ginkgo Biloba & Acetyl-L-Carnitine have been shown to enhance cognition in healthy individuals as well as those with age related cognitive impairment.
- ✓ L-Tyrosine can increase the production of neurotransmitters that are essential for the brain's functions such as processing speed, problem solving, and making decisions.
- ✓ A recent study showed that one particular type of brain exercise - called "speed training" can increase processing speed and even significantly reduce the risk of developing dementia.

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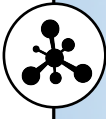






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Your results below quantify the health of the trillions of cells in your body and the functional performance of your brain. Getting to the "green zone" in each index below and staying there as you age, increases your resilience and optimizes the performance of every organ system in your body, including your brain function. Based on your assessment, your health care provider has provided the below nutritional recommendations to improve your scores and support your optimal cell health. Additionally, you can track your cell health and brain function over time to be sure you are living in the green and aging optimally.

Summary of Results & Recommendations

| Test/Description | Score History | Current Score | Recommendations |
|---|------------------------|---------------------------------|---|
|  <p>Omega-3 Index % EPA/DHA in Cell Membrane</p> <ul style="list-style-type: none"> - Memory/Focus/Mood - Risk of Dementia/Stroke/CVD - Concussion Resilience | 1/16/17 4/5/17 7/15/17 | 10/25/17 8% OPTIMAL RANGE | <p>Oily Fish (Salmon/Herring) Eat a 3 oz. serving 3 x's/week</p> <p>Fish Oil Supplement 1,000 mg EPA/DHA per day</p> <p>Ask your doctor to recommend a quality Omega-3 supplement that has demonstrated a high level of cellular absorption. The most important factor is how much EPA and DHA is absorbed into your blood cells.</p> |
|  <p>Cell Inflammation Balance Omega-6 to Omega-3 Ratio</p> <ul style="list-style-type: none"> - Inflammatory Response - Immune Function - Pain Response | | 6:1 OPTIMAL RANGE | <p>Boswellia Serrata Take as directed</p> <p>Blocks specific enzymes involved in the metabolic pathway leading to inflammation.*</p> <p>Curcumin (Turmeric) Take as directed</p> <p>Curcumin inhibits the arachidonic acid (Omega-6) inflammatory pathways.*</p> |
|  <p>Cell Toxicity Index Excess Palmitic Acid Levels</p> <ul style="list-style-type: none"> - Energy/Metabolism - Fat Burning Management - Risk of Metabolic Syndrome | | 21% OPTIMAL RANGE | <p>Protein Meal Replacement Take as directed</p> <p>Replace high carb processed foods with a low-glycemic protein meal replacement.*</p> <p>Coenzyme Q10 & Chromium Take as directed</p> <p>Encourages healthy blood sugar by improving carbohydrate metabolism.*</p> |
|  <p>Memory Capacity</p> <p>On the memory capacity test, you scored a 7 out of 10 based on your age and gender. This is considered to be in the EXPECTED range.</p> | | 7 NORMAL RANGE | <p>Vitamin D Take as directed</p> <p>Research shows that memory declines two to three times faster in individuals with low levels.*</p> <p>Phosphatidylserine Take as directed</p> <p>Shown to enhance memory for words, faces, and numbers. Also supports general brain health.*</p> |
|  <p>Sustained Attention</p> <p>On the sustained attention test, you scored a 6 out of 10 based on your age and gender. This is considered to be in the EXPECTED range.</p> | | 6 NORMAL RANGE | <p>Magnesium with B6 Take as directed</p> <p>Supports brain cells in producing vital neurotransmitters needed for sustaining attention.*</p> <p>Zinc Take as directed</p> <p>Provides antioxidant protection and has consistently enhanced attention in clinical trials.*</p> |
|  <p>Cognitive Flexibility</p> <p>On the cognitive flexibility test, you scored a 6.5 out of 10 based on your age and gender. This is considered to be in the EXPECTED range.</p> | | 6.5 NORMAL RANGE | <p>Probiotics Take as directed</p> <p>Supports gut microbiome function which optimizes the production of Serotonin and GABA.*</p> <p>5-HTP Take as directed</p> <p>Converts to serotonin as needed to promote positive mood, relaxation, and quality sleep.*</p> |
|  <p>Processing Speed</p> <p>On the processing speed test, you scored a 6.3 out of 10 based on your age and gender. This is considered to be in the EXPECTED range.</p> | | 6.25 NORMAL RANGE | <p>L-Tyrosine Take as directed</p> <p>Increases production of neurotransmitters essential for the brain's processing functions.*</p> <p>Vitamin B12 with Folate Take as directed</p> <p>Essential for structural integrity of the brain and spinal cord as well as improving overall cognitive skills.*</p> |

*This statement has not been evaluated by the FDA. This product is not intended to diagnose, treat, cure, or prevent any disease.

APPENDIX A

How to Choose the Right Omega-3

There are three main types of Omega-3 fatty acids. The two most important to brain health are EPA and DHA, which are found primarily in "oily" fish. The third type of Omega-3 is called ALA (alpha-linolenic acid), which comes mainly from plants, oils, and seeds. The human body generally uses ALA for energy and only converts trace amounts into EPA and DHA. ALA is not an effective substitute for improving brain health and will have little effect on your Omega-3 Index Score.

EPA Repairs tissue, reduces inflammation, and supports mood & focus.

+

DHA Most abundant fatty acid in the brain. It is essential for development, cellular structure, and function.

=

Brain & Body Health

Should I Take Omega-3 Supplements?

Although we encourage you to eat fish high in EPA and DHA, there are concerns about the level of environmental toxins, such as mercury, in our fish supplies. Additionally, many people (especially children) dislike the taste of "oily" fish and supplements may be a helpful option.

When it comes to Omega-3s, the most important factor is how much EPA and DHA is ending up in your blood cells. How it gets there (fish or supplements) really doesn't matter as long as it is absorbed into your cells. This is why it is so important to track your Omega-3 Index over time and know what is working and what is not. The following steps are extremely important in selecting the right Omega-3 supplements.

- **SOURCE:** Only choose Omega-3 supplements with both EPA & DHA (primarily from fish). Omega-3 supplements with ALA (from flax seeds & nuts) are not critical to brain health and will have little effect on your Omega-3 Index score.
- **POTENCY:** Don't be fooled by a label that says "1,000 mg of fish oil". What matters is the amount of EPA & DHA. Example: 700 mg of EPA and 500 mg of DHA would equal 1,200 mg toward your recommended daily total.
- **QUALITY & FRESHNESS:** Fish oils are highly susceptible to oxidation, which can make them rancid. Oxidized fish oil loses its effectiveness and will not improve your Omega-3 Index Score. When shopping for fish oil supplements, choose a quality company over simply finding the lowest price. The freshest fish oils will have little to no fishy odor and not usually produce fish burps. Additionally, be sure to keep fish oil supplements in the refrigerator to help protect them from oxidation.

Commonly Consumed Types of Seafood

miligrams of EPA/DHA per 3 oz or 85 g serving size

| Seafood | EPA | DHA | EPA+DHA |
|---------------------------|-------|-------|---------|
| Pacific Herring | 1,056 | 751 | 1,807 |
| Atlantic Salmon (wild) | 349 | 1,215 | 1,564 |
| Bluefin Tuna | 309 | 970 | 1,279 |
| Mackerel (canned) | 369 | 677 | 1,046 |
| Sardines (canned) | 402 | 433 | 835 |
| Swordfish | 108 | 656 | 764 |
| Rainbow Trout | 220 | 524 | 744 |
| Albacore or Tuna (canned) | 198 | 535 | 733 |
| Shark (raw) | 269 | 448 | 717 |
| Sea Bass | 175 | 473 | 648 |
| King Crab | 251 | 100 | 351 |
| Shrimp | 115 | 120 | 235 |
| Catfish (wild) | 85 | 116 | 201 |
| Halibut | 68 | 132 | 200 |
| Scallops | 61 | 88 | 149 |
| Cod | 3 | 131 | 134 |
| Mahi-Mahi | 22 | 96 | 118 |
| Tilapia | 4 | 110 | 114 |
| Yellowfin Tuna | 13 | 89 | 102 |

Table adapted from Harris et al. Current Atherosclerosis Reports 2008;10:503-509. Values based on USDA Nutrient Data Lab values and are for fish cooked with dry heat unless otherwise noted.

APPENDIX B

Research Supports a High Omega-3 Index Throughout All Stages of Life

Maternal dietary consumption of Omega-3 fatty acids during pregnancy improved children's IQ

In a randomized and double-blinded study from the University of Oslo, children's mental processing scores at 4 years of age correlated significantly with maternal intake of Omega-3 EPA and DHA during pregnancy. In a multiple regression model, maternal intake of EPA/DHA during pregnancy was the only variable of statistical significance for the children's improved mental processing scores.

Helland et al. Pediatrics, 2003; 111:e39-44



Higher blood Omega-3 DHA levels in babies are linked with better motor neuron development

A research team from the University Medical Center Groningen compared red blood cell DHA levels and movement scores in 112, 3-month old breast-fed babies from the Netherlands and Tanzania. The higher the DHA level, the better the scores. This suggests a link between healthy nervous system development and DHA status early in life.

Luxwolda et al. Nutritional Neuroscience, 2014;17:97-103

Children's Omega-3 DHA level significantly predicts their ability to concentrate and learn at school

An Oxford University study involving nearly 500 school-children found that blood levels of Omega-3 fatty acids significantly predicted a child's behavior and ability to learn. Higher levels of Omega-3, DHA in particular, were associated with better reading and memory, as well as with fewer behavior problems as rated by parents and teachers.

Montgomery et al. PLoS ONE, 2013; 8:e66697



Increased Omega-3 Index Scores improved both memory and reaction time in healthy young adults

A research team from Massey University in Auckland, New Zealand gave DHA supplements or a placebo to 176 young adults for 6 months. They reported that DHA raised the Omega-3 Index from 5.9% to 8.7% and that this was associated with improvements in memory scores.

Stonehouse et al. American J. of Clinical Nutrition, 2013;97:1134-1143

Low Omega-3 Index Scores associated with accelerated brain aging and lower cognitive abilities

Framingham Heart Study researchers from Boston University reported that participants with Omega-3 Index levels in the lowest quartile, when compared to the others, had lower total brain volumes. Additionally, they had lower scores on tests of visual memory, executive function, and abstract thinking.

Tan et al. Neurology, 2012;78:658-664



Low dietary Omega-3 consumption responsible for up to 96,000 preventable deaths each year

A recent study by Harvard School of Public Health revealed that Omega-3 fatty acid deficiency is the sixth biggest killer of Americans - even more deadly than excess trans fat intake. The study utilized 2005 data from the US National Health Center for Health Statistics and revealed there are between 72,000 and 96,000 preventable deaths each year due to Omega-3 deficiency.

PLoS Med, 2009 April; 6(4)

Increased blood Omega-3 levels associated with improved memory in age-related cognitive decline

In a randomized, double-blind, placebo-controlled, clinical trial conducted at 19 US centers a total of 485 healthy subjects over age 55 were supplemented with either 900 mg of DHA per day or a placebo for 24 weeks. DHA supplementation raised blood DHA levels and significantly improved several tests of learning and memory.

Yurko-Mauro et al. Alzheimers & Dementia, 2010;6:456-64



Individuals with higher blood Omega-3 DHA may significantly lower their risk of developing dementia

Tufts University researchers studied the relationship between blood DHA levels and the development of dementia and/or Alzheimer's disease in about 900 healthy men and women from the Framingham Heart study. The group averaged 76 years of age at the beginning. Those people who had the highest DHA levels had a 47% lower risk of developing dementia than those with lower DHA levels.

Schaefer et al. JAMA Neurology, 2006;63:1527-1528