

A dark silhouette of a person in a yoga pose, with one arm raised and the other hand on their hip, set against a soft, blue-toned sunset background over water.

Keeping Mentally Fit

A Guide to Managing Brain Health

Creyos Health is an online brain health assessment service used by leading healthcare practitioners to quantify and objectively assess, monitor and manage core areas of cognition that are key to your quality of life.

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With the Brain in Mind

A note on how to think about cognition by Prof. Adrian Owen, PhD, Chief Scientific Officer of Creyos and former Canada Excellence Research Chair in Cognitive Neuroscience and Imaging



Many people assume that cognitive function is rather like *height*.

That is, it's a single, unchanging (at least, once we're fully grown), physical measurement of some aspect of ourselves that we can rely on to stay constant, day in and day out. In part, this is because our notions of what cognition is are based on the first real tests of human behaviour that were designed in the 1950s and 60s to assess aspects of human *performance*, long before we knew very much at all about how the brain makes these behaviours happen. Many of these tests were based on outdated concepts like "IQ," which seek to reduce cognition to a single number and, while they do assess how well a person can perform simple tasks, they take absolutely no account of the revolution in neuroscientific understanding that has occurred over the last 25 years.

The truth is, cognitive function is not like height at all.

First, it can't be measured with a single number. We know from a wealth of recent neuroscientific studies that we can be good at one aspect of cognition (e.g., memory) and bad at another (e.g., problem solving). In that sense, cognitive performance is more like physical fitness than height. Is a great marathon runner more, or less, physically fit than a 100-metre dash champion? It's a difficult question to answer because physical fitness, like cognitive fitness, cannot be reduced to a single number. One athlete excels at endurance, while the other excels at speed over short distances. And where do long jumpers, shot putters, and javelin throwers fit in? They are all physically fit in their own way, but to be able to truly describe how one compares to another you would need a variety of different measures of "fitness." And so it is with cognitive function. Several different measures are needed to truly describe how one person's brain differs from that of another.

In a groundbreaking study, published in a leading scientific journal *Neuron*, almost 45,000 people took the Creyos (known as Cambridge Brain Sciences at the time) tasks, leading to an important discovery: intelligence is not just one thing. There are at least three independent intellectual domains: reasoning, short-term memory, and verbal ability. What's more, each domain has its own brain network behind it.

Cognition can also vary quite substantially from day to day

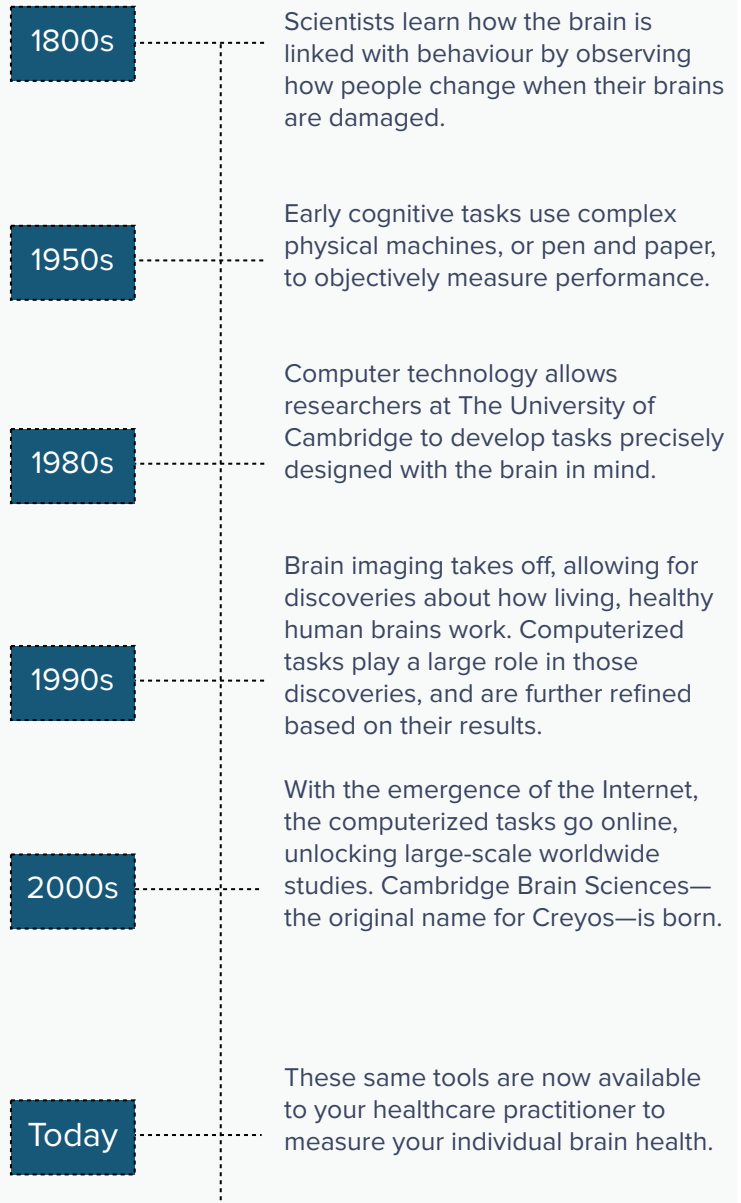
This is not because our measures of cognitive function are unreliable, but because ***cognition, unlike height, is highly susceptible to a variety of influences***, including how much we sleep, what we eat and drink, what other substances we have ingested, whether we have just exercised or not, how alert or distractible we are to other things going on around us, our stress levels, and much more. What's more—different cognitive functions will be affected in different ways. For example, if you don't get enough sleep, we know that your ability to solve problems and reason the next day will suffer, while your memory is less likely to be affected. Similarly, coffee and other stimulants will boost some aspects of cognition and have very little effects on others. In this sense, ***cognitive function is much more like blood pressure than it is like height***. That is to say, over the long term it is more or less constant (assuming you stay healthy), however significant fluctuations occur on a day to day basis depending on what you've been doing, what you've eaten, your mood, and a multitude of other factors, some known and some unknown.

The first step to managing your cognitive health: measure it

So how can you gain an understanding of what's *really* going on? The key is to start objectively measuring your cognition. While cognitive test results are meaningful on their own—just like physical fitness measures and blood pressure are meaningful—they are more meaningful as a *pattern of results over extended periods of time*. Think of your cognition scores as additional metrics, just like heart rate and blood pressure, that empower you to control and optimize your overall health.

- Adrian Owen

Evolution of Cognitive Assessments and Creyos



Measuring Your Cognitive Health

Begin by asking your healthcare practitioner if they offer tools or methods to objectively assess and evaluate your brain health. With scientifically-validated information in hand, you'll no longer have to rely on your subjective feelings, helping facilitate conversations about cognition with your family members and healthcare providers.



Two assessment methodologies are typically used by healthcare providers to assess and monitor your cognitive performance.

1

Longitudinal Tracking

Changes in your health can happen slowly, and it is difficult to know if you are maintaining your brain health over time. Tracking your cognitive performance over time will allow you to gain a long-term view of how your cognitive health is changing. Now you are empowered to collaborate with your healthcare practitioner to make informed healthcare decisions, helping build your cognitive reserve.

2

Before and After Measurements

Injuries, medical treatments and lifestyle changes can affect your brain, directly or indirectly. Measuring your cognitive health before and after a specific intervention will allow you to gain evidence that the intervention is having positive effects. You won't have to rely on communicating subjective feelings—you'll have actual numbers to back you up.

Keeping Mentally Fit: Actionable Brain Insights Based on 25+ Years of Research

Many people worry about the state of their cognitive performance, especially as they age. Some decline in cognition is inevitable and normal—everybody occasionally has trouble remembering an actor's name, or struggles to find the right word. However, more serious deficits in memory, attention, reasoning, and verbal ability can be disruptive. Luckily, science is beginning to better understand how to maintain cognitive performance today, and over a lifetime, and people who are measuring their cognitive performance regularly may be in the best position to take advantage of this latest research.

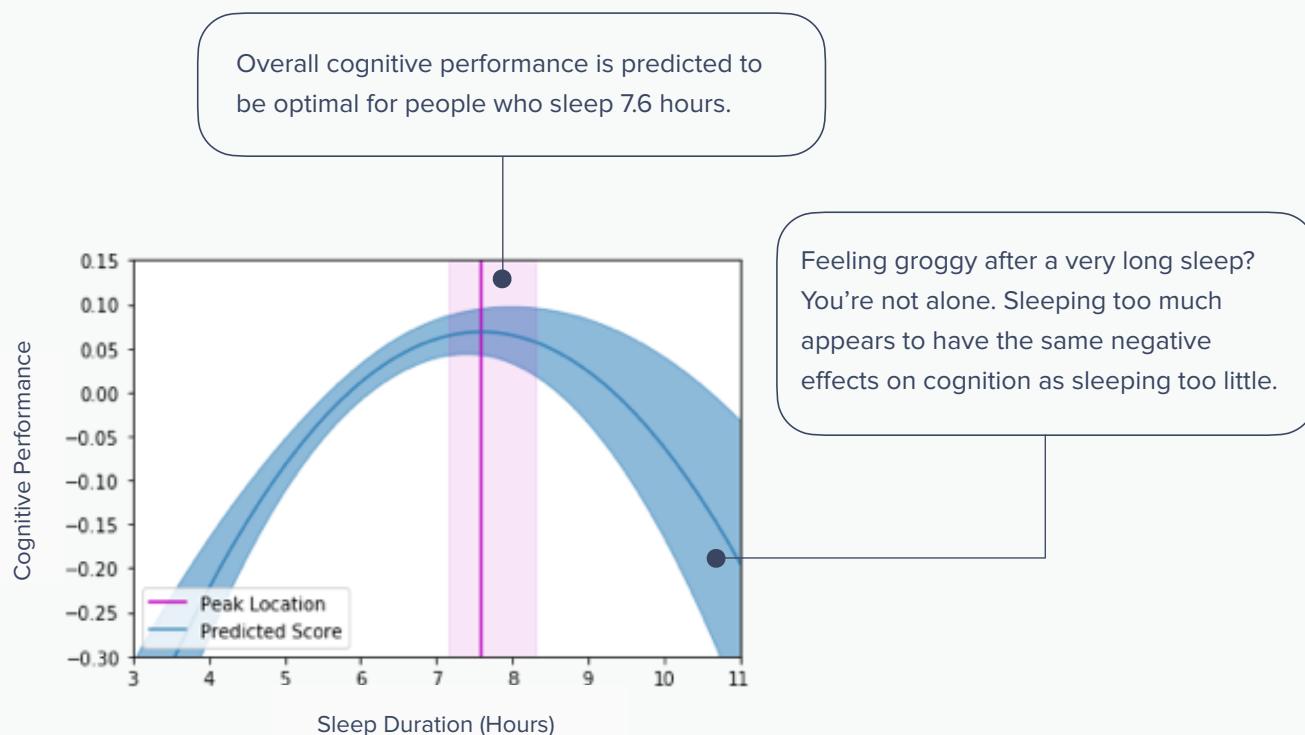
The same tools that allow you to measure your own cognition have been used by scientists for several decades now, leading to discoveries about what factors in your day-to-day life actually make a difference—and which do not.

Research is still ongoing, however a few key lessons have become clear. Smart lifestyle choices, mental health, and physical health are the main contributors to brain health. **Specifically, improvements to your sleep, exercise, diet, and stress have been scientifically demonstrated to improve cognitive performance.**

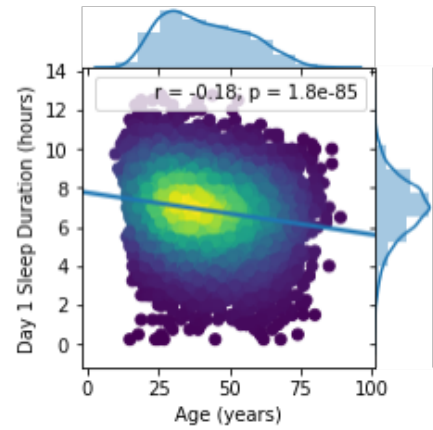
Sleep Matters

It's no secret that getting enough sleep is crucial when it comes to avoiding brain fog. Science has confirmed that people who do not get enough sleep perform worse on cognition tasks—**especially on tasks of reasoning and verbal ability**. But how much sleep is *really* enough? Unsurprisingly, cognition peaks when getting between 7 and 8 hours of sleep. Any less is associated with diminished cognition. Any more than that likely won't help either, and may even hurt.

In 2017, 38,830 people participated in the World's Largest Sleep Study, jointly led by the BBC, Creyos, and the University of Western Ontario. Participants were asked to track their sleeping patterns and take a 12-task cognitive battery every day for 3 days. The goal of this study was for researchers to understand, at scale, precisely how sleep affects cognition.



Age also plays a role. People naturally tend to sleep less as they get older, at a rate of one or two minutes less with every passing year. While you can't control your age, you *can* control “sleep hygiene” factors to build up good sleep habits.



As people age they tend to sleep less.

Sleep Hygiene Factors To Consider

Research has shown us that there are several proactive measures you can take to build healthier sleep habits.



Set consistent sleep and waking times

Including on weekends! While it's not always easily controllable, a daily routine will help your brain know when to switch to sleep mode.



Try not to eat or drink before you sleep

Don't go to bed hungry or thirsty, but avoid overdoing it with large meals or bladder-filling drinks—especially if they contain caffeine.



Avoid cognitively stimulating activities in bed

Phones, computers, and televisions can get your mind racing, making it hard to sleep.



Exercise during the day

Regular exercise will help you get a better night's sleep, but save it for the daytime, and avoid physical activity a few hours before bed.

Exercise Matters

Physical health *is* brain health. A plethora of scientific studies have confirmed that people who exercise regularly have better brain health, scoring higher in tasks of executive function, memory, processing speed, and more. It is especially important for older people—physical activity is shown to provide a protective effect against the cognitive decline that comes with age.

Exercise Tips for a Healthier Brain



What type of exercise is best for the brain?

Aerobic exercise (e.g., running or swimming) is likely the best choice, especially if you're short on time. Strength training (e.g., lifting weights) may also bring benefits, however the academic literature is more limited.



How long should I exercise for?

As little as 20 minutes of aerobic exercise is all you need for a quick boost. Longer-term effects can be realized in as little as a month of consistent exercise—aim for 3 to 4 days per week, and at least 20 minutes per session.



How else can I optimize my exercise patterns?

Combine physical movement with social interaction for maximum gains—for example, enrol in group activities, like team sports. Studies have suggested that mental stimulation, when combined with physical movement, has profound effects on the brain.

Diet and Nutrition Matter

Most people wrongly assume that being overweight only has physical side effects, ignoring the toll that those extra pounds have on your brain health. Studies have now proven that being underweight or overweight increases the risk for cognitive deficits such as dementia. People who are dangerously overweight and then lose weight tend to see improvements in memory, attention, and executive functions. At the core of any weight-loss plan should be a nutritional plan that not only helps you shed the pounds, but sets you up for a healthier brain.

Nutrition for the Brain

You may have heard that the Mediterranean diet is commonly associated with better cognitive function. But it's less about any one specific diet, and more about the specific *kinds* of foods you're ingesting.



Brain Boosters

- Fruits (berries, avocados, apples)
- Vegetables (broccoli, carrots, spinach)
- Seeds and nuts (chia seeds, almonds, walnuts)
- Fish (Wild Salmon, Rainbow Trout, Pacific Halibut)
- Healthy fats (olive oil, canola oil)
- Moderate alcohol (a glass of wine)



Unknowns*

- Superfoods (wheatgrass, goji berries, coconut oil)
- Extreme diet regimens
- Detox or cleansing (master cleanse, 7-day detox, yeast cleanse)
- Fasting (intermittent fasting, juice fasting)

* As a general rule, if you are confronted with a new regimen or superfood, ask for peer-reviewed academic studies in high-quality journals that objectively evaluate the results, and consider collaborating with a healthcare professional before making *any* major changes to your diet.

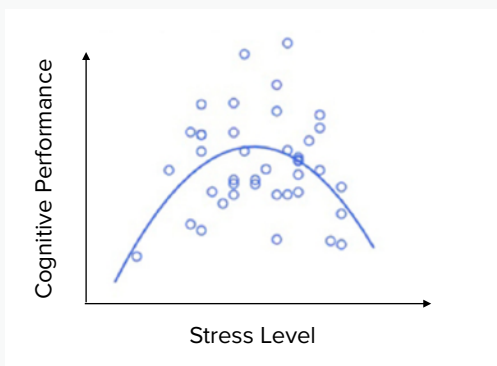
Stress and Anxiety Matter

There is a pattern when it comes to lifestyle and the brain: it's not always true that “more is better” or “less is better.” With sleep, exercise, and diet, there is a healthy range where the brain benefits most. What might not be intuitive, however, is that stress *also* follows the same pattern.

The “Inverted U-Shaped” Stress Curve

The chart below shows what happens to your cognitive function as your stress levels change. Based on this chart, in some situations, ***cognitive performance appears to peak at a moderate level of subjective stress.***

Key Takeaways



- The brain has been shown to thrive under moderate stress—however, it depends on the task
- More intuitive and emotional tasks can benefit from stress, yet thoughtful, cold calculation and working memory tasks are better without it
- Very high stress impairs all tasks, and is highest when it is seen as uncontrollable, a hindrance rather than a challenge, or has a social component

Strategies for Combatting Stress

Optimizing the lifestyle factors mentioned previously can help with stress—better sleep, exercise, and diet will better equip you to manage stress. A social support network has also been demonstrated to mitigate the effects of high stress on the brain. When stress becomes so high that it interferes with your everyday life, never hesitate to seek out help in the form of your social network and/or a medical professional.

Beware of “Quick Fixes”

There are no quick fixes when it comes to brain health, much like there is no magic pill to increase your physical fitness. Changing your cognitive performance—like most worthwhile tasks—requires effort.

Real change requires working with healthcare professionals to develop personalized action plans that are designed specifically for you. Effective steps may involve the lifestyle changes in this guide and other customized interventions recommended by healthcare experts. And by measuring your cognitive performance over time, you will have an objective way of measuring the effectiveness of these measures, rather than relying on hype or gut feelings.

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About Creyos

Creyos (formerly Cambridge Brain Sciences) leads the field when it comes to accurately quantifying brain function and brain health. Our proprietary cognitive assessments have been taken millions of times and have been used in over 300 studies published in leading academic journals over the last 30 years. Owing to years of rigorous academic development, Creyos possesses one of the world's largest normative databases of cognitive function developed from 12+ million cognitive task scores. Our cognitive assessments and health questionnaires—all delivered and scored digitally—are used by healthcare practitioners treating mental health conditions, brain injuries, aging, and other patient populations throughout the world, as well as by leading researchers.

Our assessments were developed by Dr. Adrian Owen, chief scientific officer of Creyos, and one of the leading authorities on cognition. Professor Owen is the head of the Owen Lab at the Western Institute for Neuroscience (WIN), a cutting-edge cognitive neuroscience research center at Western University in Ontario, Canada.



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