Introduction

The human brain is a wondrous organ, complex beyond any computer. During the past thirty-plus years, I have run and published many brain research studies. I've held actual human brains from autopsies in my hands. I've looked at slides with pathological specimens from patients with multiple sclerosis, stroke, Parkinson's, and Alzheimer's. I've taught thousands of students all about the brain at Harvard Medical School and Johns Hopkins University, and I've taken care of thousands of patients with memory loss, ADHD, concussion, mild cognitive impairment, Alzheimer's disease, and other neurological conditions. And now, more than ever before, I am thrilled about the recent revolutionary discoveries in my field that show we can slow and reverse early stages of late-life Alzheimer's disease.

Yet, the brain continues to astound me every day. Three pounds of gelatin-like, slippery, perilously fragile tissue, the brain is stronger and more vulnerable than you might expect. Most wondrous of all, it is ultimately malleable.

The brain is capable of seemingly miraculous feats of growth and rejuvenation. It can reroute and rewire, increase or decrease in size, produce new cells, and fire up new neuronal connections or shut them down. Damage it, and it often finds a way around the damage. Use it, and it gets smarter and better at anything. The brain's capacity to respond to its environment is a testament to why we as a species are so advanced. We can take advantage of that adaptability, flexibility, plasticity, and potential. We can take our brains to the next level, simply by what we do to them, for them, and with them on a daily basis.

How well this happens is based on the genes you inherited from your parents, but even more so on your family environment, education, work, social interactions, hobbies, and dedication to learning and practicing. You may not think about your lifestyle and activities in

terms of how they affect your brain, but you're taking care of your brain every day in innumerable ways, through daily habits: you feed your brain nutrients (through food), provide it with blood and oxygen (through exercise), facilitate its natural rinsing and cleaning mechanisms (through sleep), and challenge your brain (by training it).

For decades, scientists and doctors alike believed that we were born with a certain number of brain cells and could never grow new ones, that Alzheimer's disease was mostly genetic and certainly not preventable, and that as the brain aged, there was no turning back the clock. These myths have now been shattered. In fact, at a recent Alzheimer's Association International Conference, the notion that lifestyle impacts brain function was no longer considered radical, debatable, or even surprising. New Alzheimer's drugs are still a matter of debate—do they work, and are they worth the enormous cost? But nobody debates that we can all impact our cognitive function through our daily habits.

This hasn't always been the case. When I wrote my first book, *The Memory Cure*, in 2002, we decided we could not put "prevent Alzheimer's" on the cover because it was too controversial. Now, most neurologists agree that prevention *is* possible. We understand more than we ever have before about how dementia works and what contributes to it, and that has led to the clear realization that how we use our brains and care for them does influence how well they work—in other words, you have a lot of control over how your brain ages. According to a 2024 report in *The Lancet*, nearly half (45 percent) of dementia cases could be prevented by addressing modifiable risk factors.[i]

Based on my more than thirty years of teaching, clinical practice, and neuroscience research, mainly at Johns Hopkins and Harvard Medical School, I have good news for you: No matter how smart you think you are, or how smart you think you aren't; no matter what kind of cognitive changes you've noticed, or how often you forget what you used to remember; no matter where your brain is sharp, and where you think it might be dull; I am

here, as a neurologist and brain researcher specializing in optimizing brain function, to tell you that you could be smarter, sharper, quicker, and clearer tomorrow than you are today, and that you can protect your brain from decline as you age, in ways that are far simpler than you might expect.

The Genesis of the Invincible Brain

As a clinician-scientist, my mission has always been to make a meaningful impact on the patients I see in my office and the thousands, even millions, of people seeking ways to enhance their cognitive vitality. This passion led me on a journey spanning decades, through rigorous research, clinical practice, and ultimately, creating the twelve-week program shared in this book—a proven plan that has already changed many lives.

My journey to learning how the brain works began during my doctoral research at Johns Hopkins, where I delved into the molecular intricacies of neuronal function. At Harvard Medical School, I continued my research while immersing myself in clinical medicine and researching the hippocampus—the thumb-sized brain area critical for learning and memory—which is highly vulnerable to injuries such as concussions and Alzheimer's disease.

During my neurology residency at Johns Hopkins, I worked part-time as a consultant at the Alzheimer's Disease Research Center, evaluating patients in the Baltimore Longitudinal Study of Aging. As I reviewed cases, I noticed a troubling pattern: Many patients diagnosed with Alzheimer's had underlying, potentially preventable and treatable conditions like strokes, diabetes, or hypertension. Yet, they were given a diagnosis that often felt like a death sentence. They were not receiving information on how they could slow or reverse their cognitive decline by addressing their other, often treatable, medical issues.

Determined to understand this further, I pored over research in the medical literature and uncovered a startling truth: Alzheimer's was being overdiagnosed. Patients were being told

they had an incurable disease when, in fact, their memory issues might have been reversible. The weight of this discovery fueled a mission I could not ignore. I was determined to go on rooftops and yell out: *What we call Alzheimer's disease can be prevented!*

To begin spreading this message, I wrote my first book, *The Memory Cure,* in 2003, the same year I started my career as an assistant professor of neurology at Johns Hopkins and as the director of the Center for Memory and Brain Health at Sinai Hospital of Baltimore. I continued to see patients with various degrees of cognitive deficits and participated in several research projects. Over the following decades, I dedicated my career to researching the impact of lifestyle interventions on cognitive decline and Alzheimer's, questioning the prevailing doctrine that genetics determines our destiny by proving how supplements, medications, and physical fitness influence our brain health and how we have drastically misunderstood these common diseases of aging.

By 2011, evidence suggested that neuroplasticity—the brain's ability to rewire and grow—was more than just a theoretical concept. Inspired by ongoing discoveries in my field, I launched my brain fitness center in Baltimore, designing a multidisciplinary program for patients with mild cognitive impairment (MCI)—a transitional state between normal aging and Alzheimer's disease. In 2015, I moved the clinic to the Washington, DC, area, and named it the NeuroGrow Brain Fitness Center. I treated thousands of patients who were worried about their brains for a variety of reasons. Some were recovering from concussions or strokes. Some had migraines, ADHD, or brain fog. Many worried about their memories fading with age or feared impending dementia. I addressed their concerns with my tailored, science-based Brain Fitness Program. This exciting program is the foundation of the book you hold in your hands today.

Even before I began personalizing my program for each patient, I encouraged them to realize how well their brains worked in the many ways they *weren't* worried about. I

reminded them that their brains may be the source of their specific struggles, but they are also the source of their particular talents. It's human nature to focus on what's not working rather than on all the amazing things that work perfectly well. After undergoing cognitive testing in my clinic, many of my patients were pleased and excited to realize how well their brains worked in areas they took for granted. I helped them broaden their understanding of intelligence and appreciate just how incredible our brains truly are; many of my patients were thrilled to discover they were already smarter than they thought they were.

I assured them they could get much sharper still. That was when the real work began.

Each patient received a personalized brain rehabilitation program based on an initial neurocognitive and neurobehavioral assessment. The areas where each patient felt they had deficits and the areas where the assessments showed deficits were our focus. The program lasted twelve weeks—the amount of time I found to be the minimum possible for maximum results. The patients visited NeuroGrow twice weekly over those twelve weeks for brain-coaching sessions. My team and I instructed them on lifestyle changes, helped them to challenge their brains, and trained them on how to practice different forms of biofeedback, including a technique for improving heart rate variability (HRV), a measure of fitness, stress, and resilience.

Working with our enthusiastic brain coaches, some patients focused on switching to a brain-friendlier diet, others got their sleep in order, some focused on stress reduction, and others dove into intensive brain-training games and other exercises. Most of them focused on several areas simultaneously for maximum effect.

The results were dramatic. Nearly all patients with MCI reported some improvement, and a thorough statistical analysis of data showed 84 percent of my patients gained remarkable improvements in their objective and validated tests, scoring higher on cognitive assessments, and reporting fewer cognitive and emotional symptoms. The MRI results from our patients

showed that more than half of them had grown the size of their hippocampi by 3 percent. This meant their brains had become about three years younger in twelve weeks.

The program was so successful that I decided to share the results of our research findings on memory and Alzheimer's disease with the scientific community. I wrote a paper about it, focused specifically on elderly patients with MCI, and it was published in 2016 in *The Journal of Prevention of Alzheimer's Disease.*[ii]

Next, I decided to test the effectiveness of this program for patients of all ages who had persistent concussion symptoms for months or even years after brain injuries. Persistent postconcussion syndrome is frustrating for patients as they suffer from a dozen invisible symptoms including poor attention, difficulty keeping up with their home or work responsibilities, migraine headaches, dizziness, anxiety, insomnia, or depression. Fortunately, the program worked quite well for these patients too. More than 80 percent of them had remarkable improvements in their attention, mood, sleep, and memory, as well as in objective tests of cognitive functions. In 2020, I published these findings.[iii]

Encouraged by these much-better-than-expected results, I wondered if our program would be equally effective for children or adults who have been struggling with ADHD symptoms. I enlisted 223 patients with ADHD, postconcussion syndrome, and memory loss, and I evaluated them with tests for verbal memory, complex attention, processing speed, and executive functioning. As with my previous groups of patients, they completed questionnaires about sleep, mood, diet, exercise, anxiety levels, and depression, and underwent objective tests for their cognitive function with standard neurocognitive evaluations at the beginning, after six weeks, and at the end of the program.

The results were just as exciting as those in my previous research.[iv] Again, more than 80 percent of patients who completed this program had subjective improvements in their symptoms and objective improvements in their cognitive tests.

This success wasn't limited to adults—to my surprise, children and teens with ADHD improved *as much as my program's adult patients*. Children and teens have their own issues, such as poor diets, irregular sleep patterns, anxiety, and social and academic stress. These results underlined my longtime assertion that what is good for the adult brain is good for the child brain, and even more broadly, what is good for any brain is good for every brain.

With much research under my belt and very little time off, I began to feel like I could do more if I took my message wider. I'd been seeing patients in my clinics for twelve years at this point, but with patients flying in from across the country and our clinic still booked solid seven days a week from 8:00 a.m. to 8:00 p.m., it became clear that this program had the power to help far more people than I could personally see. I realized that anyone could implement these strategies from the comfort of their home with the right tools and guidance. I could stop repeating the same advice day in and day out for patients in my program. I could put it in a book and send that book out into the world.

I made a pivotal career decision in 2023: I retired from my practice to focus on writing this book and developing an app and a course that would empower people everywhere to take charge of their cognitive health and unlock their brain's full potential. I also continue to teach students at Johns Hopkins, George Washington University, and Harvard Medical School to educate the new generation of physicians, showing them a broader view and a more actionable perspective on the brain. I felt this could have a ripple effect through future generations of physicians and anyone who wants an invincible brain.

About This Book

This book will do for you what I did in my clinic for my patients. First, I want you to fully appreciate the intelligence you have right now by understanding how much your brain can do and what it already does for you. I will show you why we've been looking at the

brain, intelligence, and cognitive dysfunction in the wrong way. Intelligence comes in many forms, far beyond what a mere IQ test looks at. There are endless ways humans are brilliant. Understanding that can change your mind about what you can accomplish in this life.

I want you to understand in a meaningful way how easy it is to improve your brain function and experience firsthand the remarkable difference that simple changes in your daily routine can make on your cognitive function—differences that will be undeniable. The first step in my program is to complete a series of questionnaires that uncover your strengths and weaknesses, along with a review of specific medical issues you may need to address.

The lifestyle interventions in my program include learning to exercise in a way that works for you and will have maximum impact on your brain health; advice on sleeping better, to maximize your brain's natural cleansing process; a guide to eating for optimal brain function; lessons gleaned from cognitive behavioral therapy for changing mindset to manage stress; an easy way to replicate HRV biofeedback; guidance on brain training and memory tricks; and much more. I want you to feel the positive changes in your mood, memory, energy, concentration, processing speed, and reasoning—within weeks or months, not years.

Furthermore, what we call Alzheimer's disease, I (and many other neurologists and neuroscientists) argue, is the result of a soup of abnormalities rather than a single disease. Dr. Alois Alzheimer, who described the presence of pebble-like "amyloid plaques" in the brains of a few of his middle-aged patients who had confusion and behavioral issues, never claimed he had discovered a disease in older adults with "senile dementia" (a once-common term seldom used today). He knew that aging, vascular issues, and strokes, along with other nonspecific age-related problems, damage and shrink the brain. We have now come to the conclusion that Alzheimer's disease has more complex causes and simpler solutions than we once believed. I'll explain the differences between mild cognitive impairment, dementia,

vascular dementia, Parkinson's, Lewy body dementia, actual Alzheimer's disease, and the condition many people call Alzheimer's disease that, in many cases, probably isn't.

You can progress or decline, no matter where you are on that brain spectrum now—your choice. You can get sharper, quicker, and smarter, and improve your executive function and memory. Or you can let your brain go and suffer the consequences of poor circulation, compromised brain waste management, impeded blood flow, dying neurons, and cognitive dysfunction.

In part 1 of this book, we will redefine what intelligence is, assess all the ways you are more intelligent than you may realize, and look at the power of your mindset and how having a sense of purpose in life is a game changer when it comes to brain health and peak cognitive performance.

In part 2, we review the concepts of neurogenesis (the generation of new neurons) at any age and how brain plasticity works. We will take a deep sensory dive into your brain so you can see how powerful, vulnerable, and adaptable your brain is. We will examine the role of dopamine in shaping your habits and how you can learn to develop new productive habits that will shape the future of your invincible brain. We will explore how memory works and teach you fun and easy ways to improve your memory at any age, like how to memorize names, credit card numbers, and a list of twenty items, and how to remember where you parked or where you put your phone.

In part 3, we'll explore the impact of genetics and, more important, discover how to leverage the power of epigenetics to reverse the effects of aging in your brain. We'll explore findings from my research papers about boosting your brain performance by growing the sizes of your cortex and hippocampus, and challenge the assumptions that Alzheimer's is a disease. We will explain in simple terms the nuances of the exciting new discoveries about the prevention, diagnosis, and treatment of Alzheimer's disease in the very recent past. I'll

tell you everything you need to know about the latest Alzheimer's biomarkers and whether or not you should take the new medications for Alzheimer's disease, and I'll show you why it's just not true that an aging brain is a less capable brain. I will discuss how the health and vitality of organs below your neck are essential for the optimal functioning of your brain, and teach you how to increase the reserve in your body organs, which can ultimately help to grow and strengthen your brain.

In part 4, you will learn about my Brain Fitness Program—the same one my patients used in my clinic that resulted in such dramatic and impressive cognitive gains. You'll create a Brain Portfolio and get a comprehensive list of tests and questionnaires to complete. You'll assess your brain function to determine where your brain is doing well and where you might want to intervene, with guidance on maximizing your strengths and addressing the areas that could be doing better. You'll learn about the five pillars of brain health and the most critical interventions to fast-track your brain's invincibility. We will consider the real meaning of happiness, quality of life, and sense of purpose. What do you live for?

I'll make the case that intelligence is knowing how to live a happy life and that building an invincible brain is worth every effort. Ultimately, you'll not only know how to prevent Alzheimer's, you'll know how to build a brain that can withstand aging with grace and strength. You will learn how to become one notch sharper in a matter of weeks.

There is so much to learn about your brain—but even better, it's never too late to improve your brain functions. Let's figure out what that means for you, what you can do to make it happen, and how to start right now. No matter what you want out of the rest of your life, you'll achieve it more easily with a brain that is bigger, faster, smarter, and practically invincible.

[i] Gill Livingston, Jonathan Huntley, Kathy Y. Liu, et al. "Dementia Prevention, Intervention, and Care: 2024 Report of the Lancet Standing Commission." *The Lancet* 404, no. 10452 (2024): 572–628. Accessed April 9, 2025. https://doi.org/10.1016/S0140-6736(24)01296-0.

[ii] M. Fotuhi, B. Lubinski, N. Hausterman, T. Riloff, C. A. Raji, and M. Trullinger. "A Personalized 12-Week "Brain Fitness Program" for Improving Cognitive Function and Increasing the Volume of Hippocampus in Elderly with Mild Cognitive Impairment." *The Journal of Prevention of Alzheimer's Disease* 3, no. 3 (2016): 133–137. https://doi.org/http://dx.doi.org/10.14283/jpad.2016.92.

[iii] M. Fotuhi, A. Y. Ebadi, P. Dwivedy, et al. "Retrospective Analysis of a Comprehensive Concussion Recovery Program." *Journal of Rehabilitation* 86, no. 1 (2020): 20–31.

[iv] Majid Fotuhi, Noah D. Khorrami, and Cyrus A. Raji. "Benefits of a 12-Week Non-Drug 'Brain Fitness Program' for Patients with Attention-Deficit/Hyperactive Disorder, Post-Concussion Syndrome, or Memory Loss." *Journal of Alzheimer's Disease Reports* 7, no. 1 (2023): 675–697. https://doi.org/10.3233/ADR-220091.