NEUROSCIENCE CALISTHENICS

HIJACK YOUR BODY CLOCK

Jean Fallacara

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Any references to historical events, real people, or real places are used fictitiously. Names, characters, and places are products of the author's imagination.

Front cover image by Chantal McClean – Athlete: Gregoire Bellemare

To Noée:

This book would not have been possible without the help of my 16-year-old daughter, Noée, who checked, revised, restructured, and corrected every word, line, and chapter in this book.

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Introduction

We all aspire to live a long and healthy life and know that staying active is critical to achieving this goal. Anecdotal evidence suggests that we physically peak at around the age of 20. That is what most physical trainers and athletes, but mainly the media will tell you, but you can't really blame them given how they're used to seeing this play out in competitive sports. Most gymnasts and Olympic athletes usually reach their prime in their late teens or early twenties, before walking off into the sunset (retiring).

Let's take an example of Usain Bolt; he earned gold medals in several world championships since the age of 15 but wasn't until the 2008 Beijing Olympics that he lit up the world stage and broke the world record for the 100-meter sprint. Since then he went on to break his own records and earn consecutive gold medals in the 2012 and 2016 Olympics, up until the age of 30, after which he retired. Seeing a pattern?

Most people do not attempt demanding sports once they reach their late 20s or 30s and many more avoid extensive physical exercise past their late 40s. Instead, priorities change with age, adults opt for sports such as golf, tennis, table tennis, or cycling. Of course, the main reason is due to the increased risk of injury. Pre-existing injuries and/or the fear of getting injured can influence the choice of sport.

Many adults express a desire to stay active in sports, but they assume they're past their prime because of their biological human clock. People assume that their bodies already attained their maximum potential during their twenties and training and they can never reach the same level. I am about to prove to you that this is completely untrue.

Everyone wants to stay and feel young. They all wish to be more active in sports at any age, without the risk of injury or damage to the body, but unfortunately, not everyone is able to ward off injury. Well, what if I tell you that all of this is possible– that you can actually achieve your fitness goals irrespective of age. Everyone, even you, can do it!

Training the mind is just as important as training the body. To achieve your true potential, you must first convince yourself that you can do it. Only then

will your mind give you the resources needed to act upon your fitness goals. There is a quote by Shakespeare that goes,

"Hamlet: there is nothing either good or bad but thinking makes it so."

Our mind is extremely powerful; it can either become your greatest ally or your worst enemy. I cannot emphasize just how important training and conditioning the mind is.

Nature vs Nurture: Knowing right from wrong is something that is decided by our brains; thanks to its determined sense of moral values. Our moral values are instilled in us since our childhood, this means that our minds are trained to think a certain way, to consider something right and something wrong. It is our conditioning in the earliest parts of our life that makes us identify right from wrong.

Now imagine if you could train your brain to break through our inherent limitations; to tap into unadulterated potential and use it to achieve things previously thought impossible. You might think that learning a new language is impossible after a certain age, or that doing gymnastics in your forties and beyond is impossible because of your aging body.

But let me tell you this, these are arbitrary limits that you have imposed on yourself. That is just your brain telling you that it is impossible, mainly because you have not tried it yet. This is a common misconception that prevents us from achieving our true potential. It's only human nature to submit to self-imposed limitations.

When you were young, how many times did you think learning a new skill was difficult until you finally learned it? How many times did you think doing a particular exercise was impossible until you were able to do it after some practice?

What then, is the difference between doing something when you are in your 20s and doing something when you are in your 50s? The answer is your mindset. You are so used to seeing people fail at physical exercises later in life that you assume you cannot do it either. You'll have to recondition your mind against this perceived impossibility.

Visualization and mind control are some of the tools that great athletes use to prepare for matches and competitions. They train their minds to ignore all

their previous losses and failures and focus only on the wins and achievements; this significantly boosts their confidence and performance.

Where do you think they get the strength to break records or accomplish tasks that they were unable to do before? How are you able to complete an exercise when you could not do it the first time? The answer is that practice makes perfect. When you practice and make up your mind to accomplish something, your brain adapts to this new line of thinking and utilizes all available resources to learn new skills and techniques until you achieve your objective. When you can tap into the power of positivity, your mind can do wonders for you. You are able to destroy self-imposed limitations, and as a result, get one step closer to breaking your own personal records.

Elite athletes around the world realize the importance of training the mind and therefore, they spend considerable amount of time and effort in training both the mind and the body – in that order. It gives them the extra boost they need. Our psychological state greatly impacts how we behave. Depending on our mental state, we could either see the glass half empty or half full. Thinking that the glass is half empty will only dishearten us and make us think that it is useless to exert more effort. However, adopting the glass-half-full method enables us to recognize the positives in a situation and in turn tell us that any and all effort is worthwhile.

Perspective influences everything at the end of the day, because the glass is very much like your brain: refillable. In a competition, a change in mindset can mean a great difference for an athlete. It can determine whether he/she falls short of first place by a mere millisecond or they go above and beyond to achieve victory.

I'm going to let you in on a secret … I am at that age when everything seems impossible because my body is old. Yet, I refuse to let myself be constrained by such limiting beliefs.

My preferred method of workout is calisthenics – a form of fitness that engages your entire body weight with little to no equipment. You use your own bodyweight to perform exercises that activate your muscles throughout the body. After years of training, I can perform complex and challenging calisthenic exercises despite being older because I learned to train my body as well as my mind – the result is that I can acquire new skills in little to no

time. I want to tell you that age really is just a number and does not determine the state of your biological clock. You can easily reverse your biological clock and feel young again much like the legendary Turritopsis Dohrnii jellyfish.

For those of you who might not know, the Turritopsis Dohrnii jellyfish is also referred to as the Immortal Jellyfish and there is a good reason why it earned this name. This species of jellyfish have been known to never die. After the jellyfish have grown to a size of 4.5mm in their adulthood and have reproduced, they then proceed on to return to their juvenile polyp state. This means that their bodies shrink, and they sink to the ocean floor. During this phase, their tentacles also retract and they begin the growing cycle anew. There is no known limit to their ability to repeat this indefinitely, scientists believe they can repeat this process as many times as they want. Can you believe that?

Now, I am not saying that you can be immortal. That would be ridiculous! But I am saying with reasonable accuracy that you can reverse your biological clock. This is because your brain is constantly producing new neurons that are used in making new connections in the brain, helping you advance your skill set and learn new techniques. It has been observed that the human brain produces new neurons throughout its life, this, I believe is one of the greatest breakthroughs in the field of neuroscience. This essentially means that the brain never really stops learning and developing. This discovery has opened the doors to improved learning and memory capabilities in our brain well past its “prime.” It also means that what our previous assumption about not being able to learn in adulthood was a fanciful myth we imposed on ourselves.

The research proves that biologically there is no such limit that stops our learning and growth and the only thing stopping us is our own shackles. It is possible to learn new complex skills and to acquire new traits even in the later years of our lives. So, I ask again, what is really stopping you? Turns out, those motivational quotes your fitness trainer shouts into your ear are not in vain after all – it’s not just pretentious forms of philosophy. I can tell you that it is true and entirely possible because I have tried it on myself and continue to achieve new milestones. Physical and mental exercises have become an integral part of my daily life.

Understanding the mind is key, by increasing your brain's capacity to grow, you can optimize the functions and performance of the body and break the illusions of constraints related to age or other factors.

You can, to some extent, reverse the actual aging process and accomplish feats that you might have never thought possible before. These accomplishments don't necessarily have to involve breaking world records and can be the fulfillment of an individual's ambition. The key takeaway is that adopting this mindset can help you to attain a healthy lifestyle that you envisioned.

Accepting that you can do anything and everything with discipline and practice will help you stay motivated and focused on your life goals. This will give you the boost you need to cause a shift in your attitude and personality. Irrespective of your age, gender, or race, you will become a go-getter. That is what this book aims to achieve: to teach you how to adopt this mindset and to lead a healthy life. If you incorporate the neuroscience techniques I show you in this book, you'll be on the fast-track to learn anything you put your mind to.

My preferred method of adopting a healthy lifestyle is by learning calisthenics and practicing it properly. This book will delve deeper into the science behind physical exercise and backs every claim with scientific facts. I've explained the exact science behind training the mind and the body in great detail; along with a how-to guide on biohacking your mind.

This book is meant to serve as a guide for fitness enthusiasts, athletes, fitness trainers, biohackers, business owners, performers, and anyone who wants to adopt a healthy lifestyle and keep enjoying fast-paced sports even in the later years of their lives.

The theory of neuroplasticity and its application in biohacking is discussed in the book along with ways to reverse one's epigenetic clock to regain youth. This can be done without prescription medicine or intake of supplements and without resorting to extreme dieting. Supplements can only go so far as to make you appear fit. By exercising sufficiently (keyword being sufficient) and cultivating a healthy mindset, you can increase lean body mass, strength, and endurance without overloading on carbs. Once your mindset, brain, and focus are aligned, then you and your body will achieve complete

synchronization. This will give you a positive outlook on life and help you reach peak physical fitness.

One of the primary focus of the book is the significance of mindset and how it enhances physical performance. The book also sheds light on different ways to train the body. It explains the importance of calisthenics in fitness among other sports. The difficult skills it entails offer an easy pathway for both athletes and regular people alike to apply the growth mindset. One of the prerequisites of performing well in calisthenics is a well-conditioned brainThis is justified by how the learning of new physical skills in extreme sports can be executed through programming the mind.

The Importance of Rest and Sleep

The human body is a living, breathing organism and thus cannot keep performing continuously without proper rest. The importance of sleep in the development of the human body cannot be stressed enough. Sleep is an integral part of training the mind and body, in fact, some of the most important functions in biological growth happen during rest and sleep. Athletes are required to keep a strict schedule for training inside and outside the gym.

But they're also required to sleep well along with following a very specific diet plan that is specifically designed to build the body. Although you have a lot of choices when it comes to choosing a diet plan, the key is to monitor the intake of calories and nutrients because they heavily influence the composition of the body. It is true that you are what you eat, but it is not true that a single universal diet plan works for everyone because no two human bodies are exactly alike.

The composition of the human body is different for everyone, thus a similar diet or supplementation plan cannot be prescribed for everyone. Diet and exercises must be customized for an individual to the above-stated fact and in order to do so, the human body and how it behaves must be monitored to observe the effects different practices and foods have on it. By observing how your body reacts to certain food groups, you can build your own diet plan and customize it according to your needs. In such cases, biohacking can be used to make these processes easier and faster.

When it comes to training the brain, a tried and tested biohack strategy is the

use of music to change our mood. Have you ever noticed how a particular song makes you feel nostalgic, sad, inspired, motivated, or happy? How can a set of sound wave patterns affect your mental and emotional state? The answer is that music has a great influence on us which is probably the reason we make separate playlists for when we are sad and when we are happy. I even have a playlist for when I exercise and I am sure some of you also have one. That is also probably the reason fitness centers are always playing hard bass and upbeat songs, so you stay motivated and the reason malls and public gathering places usually play pop music and slow songs. There are even specialized sounds that one can listen to in order to meditate. There is an underlying science that explains the influence of music and how it influences the way we feel and act. It's a kind of biohack that is thoroughly explained in this book.

Meditation is one of the ways through which you can focus on the mind while keeping the body at rest, but there are other methods as well that allow us to monitor the mind with accuracy. Among these, one of the more reliable and scientifically proven methods is known as biofeedback. It enables an individual to learn how to change physiological activity for improving health and overall body performance. It uses precise instruments that record various readings from the human body such as brainwaves, breathing, skin temperature, and muscle activity to determine the state of the mind. The readings and results depict an individual's emotional and mental state along with what they are thinking.

In the case of biohacking, I intend to guide you only by example which is why the book also contains reviews of some biohacking products that could be used for this purpose. But do they actually work, you might ask?

To answer that question, I have tested a few of them and have added my review in this book with the results that they brought. Once again, let me re-emphasize that this book only aims to be a guide for living a healthy life and training the body and mind by performing calisthenics exercises and attaining a learning mindset. But it also guides you to these objectives by discussing biohacks and their underlying scientific basis. I hope that you can learn something from this book that benefits you and helps you achieve your goals in life. If it does so, then I will consider it to have achieved its purpose.

Chapter 1: Neuroscience, Neuroplasticity, and Biohacking

So What Exactly is Neuroscience?

Neuroscience is a discipline that essentially deals with the study of the entire nervous system. It is primarily derived from biology, and it integrates with other disciplines such as physiology, psychology, anatomy, molecular and cellular biology, mathematical modeling, pharmacology, and medicine. It delves into the realm of memory, learning, behavior, consciousness, perception, reasoning, and is considered by many to be one of the more complex fields of the biological sciences. Professionals study all aspects of neuroscience, from cognitive function to single-neuron physiology and genetics. Understanding how the brain works is at the core of neuroscience research.

While the application and scope of neuroscience have broadened considerably over time, its governing principles stay true to its foundations. Studying the neural networks that deal with learning, movement, and behavior forms a big part of neuroscience, but it is just as important to inspect these neural networks. This is particularly true for emotions as they are so difficult to characterize (apart from innate fear, which elicits a sharp response from amygdala neurons). Emotions, as well as the thoughts a person has, greatly influence how neural networks function during a particular behavior. For example, positive emotions can enhance learning and memory, while stress usually has the opposite effect. This is because the expectation of a reward leads to the release of dopamine, which can help strengthen the connections between neurons, whereas, the stress hormone cortisol can prevent this strengthening.

Neurologists and psychiatrists also use their knowledge from the discipline to treat disorders of the nervous system. They look at findings and studies that have been previously conducted in the field to find similarities in the behavior or symptoms of their patients to derive a treatment plan. Injuries or

disorders to the nervous system require particular attention and care and they do not just heal quickly which is why neurologists and psychiatrists also devise ways to rehabilitate those patients and minimize their risk of relapsing.

Different methods have now been developed to help visualize and detect problems in the nervous system and the brain without the need for invasive surgeries.

These include neuroimaging, a branch of medical imaging specific to neuroscience which uses MRI (Magnetic Resonance Imaging) and DTI (Diffusion Tensor Imaging) to capture images of the brain. Together with EEG recordings (electroencephalogram), which is the recording of electrical brain signals, these methods allow scientists to investigate how the brain works and what influence various activities have on it These methods also generate a large amount of data. For this reason, concepts from applied mathematics, physics, statistics, and artificial intelligence are used to interpret all the data and create computer models of brain function. Functional MRI and EEG recordings allow scientists to measure brain activity while people carry out different tasks, to infer how neural networks behave during certain activities.

Fun fact – AI scientists use concepts from neuroscience like neuroanatomy to inspire artificial neural network architectures and neuroscientists employ AI tools to study real neural networks.

Another important branch of neuroscience is cognitive neuroscience, which analyzes how thoughts are created and manipulated.. Scientists now understand that there are various factors involved in shaping and influencing thoughts. That being said, the domain of cognitive neuroscience that is most studied is learning and memory.

Cognitive neuroscientists study how the activity of neural networks changes during learning and memorizing to understand how memories are formed. This allows them to find new ways of improving the learning process and memorization.

On a cellular level, learning occurs through changes in the connectivity between neurons, known as synaptic plasticity. At the network level, learning is reflected by changes in patterns of brain activity through time, along with improved performance.

To get an idea of how the brain works, it is important to understand the basic anatomy of the brain, but don't worry, you don't have to go into too many details. The cerebrum, cerebellum, and the brainstem are the three primary areas that constitute the brain; among these areas, the cerebrum is the largest, followed by the cerebellum, and lastly by the brainstem.

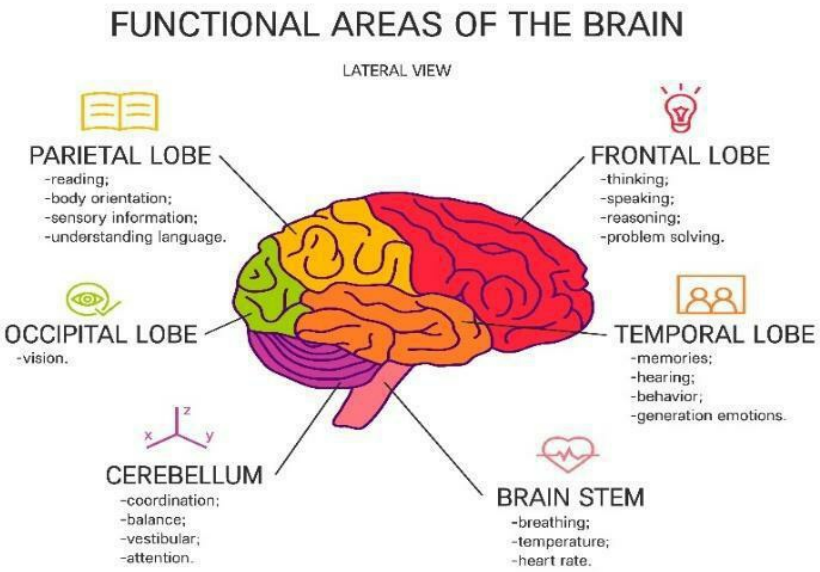
The cerebrum consists of the right and left hemispheres of the brain; by virtue of connecting both hemispheres together, the corpus callosum is involved in learning, including motor control.

This part of the brain mostly performs higher functions such as motor skills, sense of touch, vision, hearing, speech, emotions, learning, and many others. The cerebellum, on the other hand, is primarily involved in maintaining balance, posture, and coordinating muscle movements. Both parts of the brain are connected to the spinal cord via the brain stem which holds the additional responsibility of carrying out unconscious tasks such as bodily functions and cycles. Note that it can be tricky to tell the difference between the unconscious and the subconscious. Despite their separate functions, almost all these parts of the brain need to stay active to perform simple functions. This is because doing a certain activity requires humans to perform various operations at the same time. For instance, when you speak, you activate several muscles in your larynx, cheeks, jaws, chin, tongue, and face along with thinking and forming thoughts while continuing to perform essential functions such as respiration and digestion.

If the human mind was incapable of multitasking, we would never have dreamt of performing operations with our bodies the way that we do now. Can you imagine what it would have been like if you were not able to use multiple muscle groups simultaneously? We wouldn't even be able to walk and talk at the same time – performing sports and fitness exercises is a far cry. What our body would have been without the high functioning abilities of our mind is perhaps a discussion for another time. Instead, let us focus on how to take advantage of our brain's potential to gain full control of our body's performance. Indeed, our brain allows us to control our entire body with great precision, accuracy. Among all living things on this planet, we are probably the ones with the greatest degree of control over their complex body structure, but we are not born with such a level of control.

When we are born, our brains are not fully developed, which is why we have

so much to learn. We gradually learn to walk, then to speak, and eventually, we move on to learning more complex things. This untested potential of our brain to learn begs the question, **“Does the human brain ever stop learning?”** Is there even a limit to how much the brain can learn?



Understanding Neuroplasticity

Up until a few years ago, it was popular belief that after reaching a certain age, the human brain stops learning. This explains why some older adults never tried to put much effort into acquiring new skills. Researchers believe that this learning and memory process is made possible by neurons and neural networks continuously adapting as we learn and maintain relevant changes to form memory engrams. This is what neuroscientists call neuroplasticity.

The brain is constantly adapting, learning, and becoming more efficient. Just as nutrition impacts the health of our body, what we expose ourselves to, impacts the health of our minds. Our brain is at its most plastic during the early years of development when we have a lot to learn. It is also highly plastic after trauma, as it develops compensatory mechanisms to recover functionality. But plasticity is not limited to just those periods, in fact, we can learn at nearly every point in our lives. And we definitely don’t need a

traumatic experience to rewire our brains, all we need is adopting a positive attitude combined with a growth mindset – not much effort required here., Does this make sense?

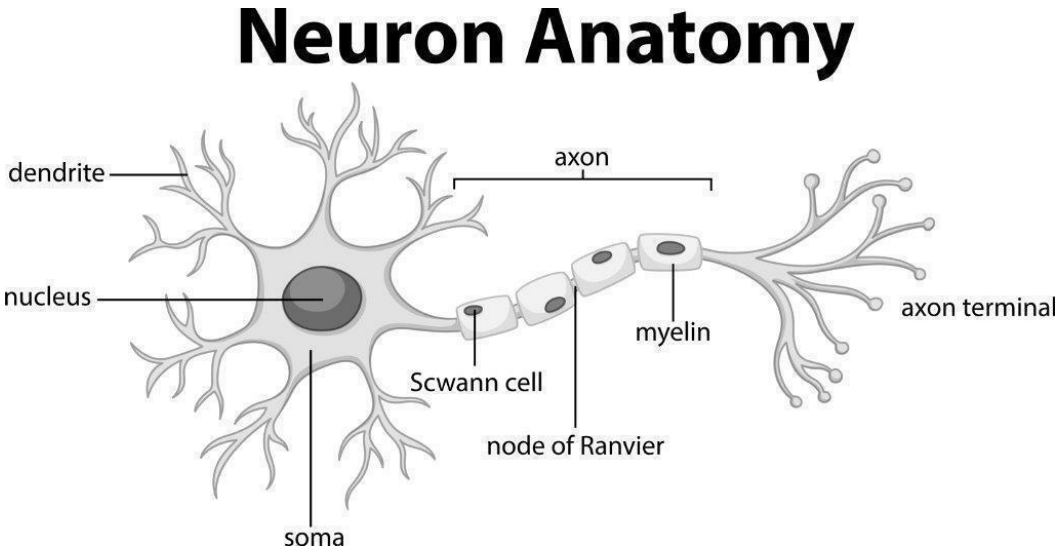
Neuroplasticity and rewiring the brain

Scientists have recently discovered that the human brain continues to produce new neurons throughout its life span. This discovery stirred up a lot of excitement opened new avenues of research dedicated toward finding ways to leverage these newborn neurons to support cognition and rehabilitation. Because the brain can adapt, learn, and produce new neurons, it can constantly evolve and has the potential to learn and improve throughout our lives.

So what are neurons?

Neurons are specialized brain cells that send and receive signals from all over our body and are highly interconnected with one another. Neurons transmit electrical signals to other cells via their axons; they can connect with many types of cells from our muscles, gut, and of course other neurons. Neurons receive and process signals via their root-like extensions known as dendrites. A newborn baby has about 100 billion neurons. Once a stem cell has differentiated into a neuron, it does not reproduce or regenerate other neurons. They are not replaced once they die, we simply create new ones.

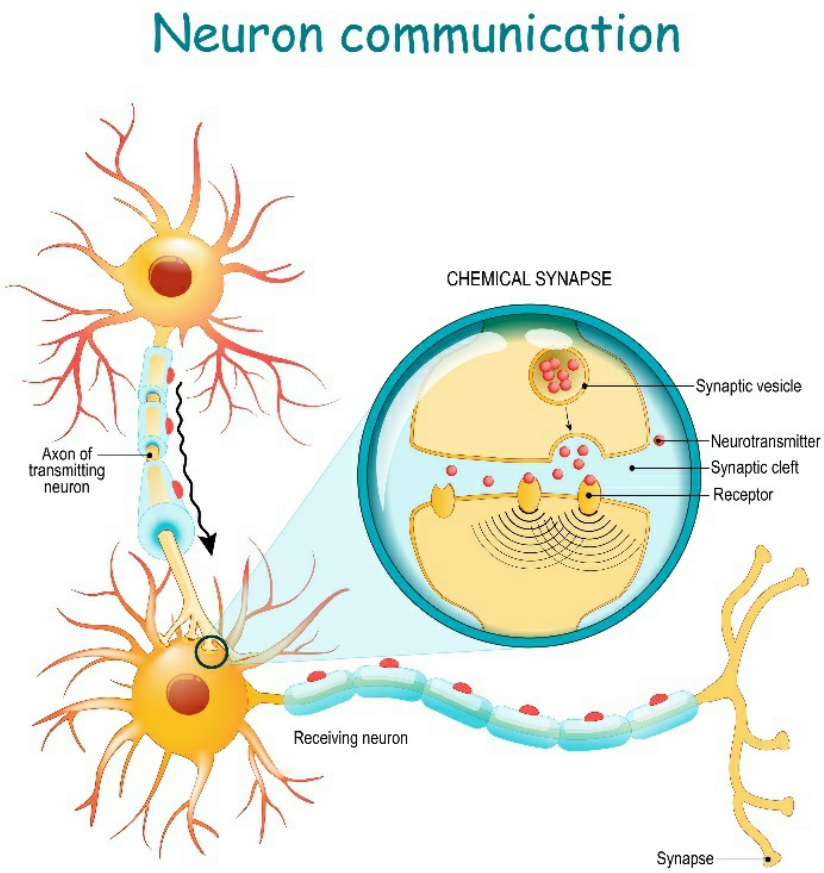
This is called neurogenesis.



Cellular level, synaptic plasticity

The main form of plasticity is called synaptic plasticity and occurs at junction points between neurons, which is called the synapse. Neurons are not directly connected with one another, but via a synapse which is a zone between a neuron terminal and a dendritic spine, containing a high density of channels and receptors .

Neurons communicate with other neurons or muscle cells via their extensive network of synapses. The strength of the connection between neurons depends on the number of synapses, the location of the synapse along the dendrite or cell body, and the density of receptors. This is where neuroplasticity plays a role, i.e., by modifying synaptic strength.



Synaptic plasticity received a lot of attention after Donald Hebb published his book in 1949, titled "*The Organization of Behavior: A Neuropsychological Theory*", in which he outlined his theories about learning. His most famous quote can be summarized as: "*Neurons that fire together, wire together.*" Broadly speaking, this refers to the long-lasting change in synaptic strength that

occurs after nearby neurons are repeatedly activated at the same time. Synaptic plasticity has since been extensively studied and we now know that the pattern of activation between neurons influences whether their connections become stronger or weaker, which are termed as long-term potentiation (LTP) and long-term depression (LTD), respectively.

Synaptic plasticity can be divided into three forms:

- Homosynaptic plasticity follows Hebbian-type learning rules and is the strengthening of synapses between directly connected neurons that are simultaneously active.
- Heterosynaptic plasticity refers to the joint LTP-LTD that occurs when the activity of some nearby neurons are correlated and the others, anti-correlated (Royer and Pare, 2003).
- The third form is homeostatic synaptic scaling which is the scaling of synaptic weights following prolonged changes in activity. Current theories of neuroplasticity points to the homeostatic regulation of neural activity, synaptic plasticity, and compensatory scaling of synaptic weights, in maintaining balance and refining connectivity (Bridi et al., 2018; Chistiakova et al., 2015).

In simple words, neuroplasticity is like an optimization process aimed at improving efficiency.

Synaptic plasticity, in itself, is not sufficient to form long-lasting memories.

LTP and LTD are transient, lasting in the order of hours. For long-term memory to develop, synaptic plasticity needs to be accompanied by structural changes at the level of the neuron's terminals. Indeed, learning and experience-dependent plasticity can induce an increased dendritic spine turnover and local changes in spine density. This means that new experiences can induce new spines to form and cluster on dendritic branches (Chen et al., 2012), which is eventually offset by the elimination of other dendritic spines a few days later (Xu et al., 2009), this helps with the optimization of networks while maintaining balance.

Experience-induced reorganization of population activity

For synaptic plasticity to support learning at a functional level, an entire network of neurons need to modify their activity. Neuroplasticity also occurs on a population level. It is well known that elite athletes and professional musicians engage much smaller brain areas of their brains than beginners. This mostly occurs of overtraining, neurons that are simultaneously active become more tightly coupled, whereas other synapses fade out, making neural networks more efficient and faster, thereby optimizing their activity (Pi et al., 2019).

One does not need 10,000 hours of training to induce plastic changes. A 2015 study published in Nature, shows that after two weeks of training, the excitatory neurons in the motor cortex refined their pattern of activation and developed a reproducible spatiotemporal sequence of activity (Peters, Chen, and Komiyama, 2015). This change in population activity was also accompanied by a transient increase in dendritic spine turnover of those neurons. This means that only two weeks of training can have an impact.

Systems-level reorganization

Neurons are grouped together into brain structures or functional areas. The cortex is the outermost layer of the brain and can be divided into functional areas like motor, sensory, and executive function.

The motor cortex, for example, contains neurons that project to all the muscles in the body, enabling movement.

Underneath the cortex are specialized structures such as the thalamus, hippocampus, basal ganglia, and amygdala – together they play a role in

movement control, relay of information between sub-cortical areas, memory, consciousness, and emotions.

Brain structures and cortical areas are connected in an intricate way to form systems. For instance, the limbic system is comprised of the limbic cortex, hippocampus, amygdala, septal area, and hypothalamus, and plays a role in the regulation of emotions including their impact on cognition.

Many cognitive functions, particularly those involving executive function, have access to more than one network of brain structures to facilitate seamless execution. In fact, different brain systems can complement each other and ultimately compensate for one another in a situation of injury or with advanced age. The best examples come from acquiring a new skill. The acquisition of new knowledge or a new skill will activate different brain networks. This is in stark contrast to areas of the brain activated when a skill is so well learned that one no longer needs to think about it.

In animal models, this is referred to as goal-directed behavior and habitual behavior. These two forms of learning rely on distinct networks of regions from the cortex and the basal ganglia.

When we first learn a new task, we typically have a goal in mind, whether it is to build muscle, learn a new skill, or just learn a bunch of facts before a test. It is a form of learning that is more flexible because the brain has yet to process how important this new information is. As we reach milestones or goals, we feel biologically good because the brain releases dopamine. This powerful neuromodulator not only makes us feel better, but it also strengthens our neuronal connections a lot faster, by facilitating neuroplasticity. This means that by enjoying learning and growing, you can get better at it faster.

Having said that, you do not have to like something, as a prerequisite to learning it. With enough repetition, you can learn just about anything. It may take much longer, but it will happen. This is particularly true for motor learning, where you can learn new skills without realizing it, as in the case of swimming. Learning how to swim involves familiarization with the proper technique, but the majority of the learning comes from constant practice. Habitual behavior corresponds to any task that is done automatically. This form of learning does not trigger dopamine release and is much more difficult

to modify. But it relies on a much faster network of neurons. The pattern of conditioning or training can impact how quickly a skill becomes habitual.

This was shown in individuals while they learned a simple motor task; an fMRI scanner tracked their brain activity on multiple days as their behavioral performance transitioned from slow and challenging to fast and automatic. The scientists found that early in training, the frontal area of the brain was engaged along with the motor and visual cortical areas. But after six weeks of training, only the motor and visual cortical areas were active during the task. The levels of disengagement from the frontal areas correlated with the rate of learning (Sun et al., 2006; Bassett et al., 2011; Bassett et al., 2015). The process reminds me of the useful investigative techniques deployed for cognitive neuroscience in complex video games, where it was demonstrated that brain activity associated with cognitive control can predict the learning rate.

Neuroplasticity in the adult brain

We can continue learning throughout our lives. Neuroplasticity does not end once we become adults. We are always confused between learning and education. For someone with ADD (Attention Deficit Disorder) like me, education is really a pain, but learning is totally a blast.

While learning is a constant process, it isn't necessarily conscious. We learn so many skills unconsciously. For example, when we are born, we learn how to breathe then, we learn to walk, and talk.

Learning is simply the acquisition of knowledge through experience and education.

If you stop learning: You start to die!

Learning is only possible due to the ability of neural networks to reorganize themselves and change how they are interconnected: THE NEUROPLASTICITY!

I hope you can now appreciate the concept of neuroplasticity and how it can be used as the best possible biohack.

This is what we aim to achieve. We need to condition our brain so that it "rewires" itself for optimum performance and functionality.

We understand that the purposeful rewiring of the brain is not as simple as it sounds, and it doesn't only depend on the number of times you practice something, it also depends on how you train, how invested and interested you are, as well as your overall outlook towards life.

If you start believing in this phenomenon and accept that one's skills, talents, and abilities are not limited, but that they can be honed through sheer determination, you may be able to enhance the effects of neuroplasticity in the brain.

Accepting a growth mindset and using it to exploit your brain's neuroplasticity to its fullest potential is perhaps the only way to optimize its effectiveness.

Although scientific research shows that neuroplasticity is lower in adults than it is in kids, it is never obsolete.

Your brain keeps producing new neurons throughout its life and adapting its networks, but it is up to you to utilize your brain to its full potential.

Neuromodulatory influences

Dopamine, endorphins ─ the understanding that I have is that certain neuromodulators can influence learning and plasticity.

Based on several studies and publications on long-term intensive gymnastic training, which is the closest sport to calisthenics, it can be clearly demonstrated that this form of workout induces structural and functional reorganization in the brain.

Also, other studies have even identified structural and functional neuronal pathway differences in elite athletes compared to non-athletes, this happens at the whole-brain level.

So, let us go back on our investigation in the **brain** functional plasticity and look at the following:

Emotions and neuromodulatory influences

I understand this part can be hard for some individuals to accept, but our emotional system is arguably the best biohack that we can use to facilitate learning.

Neurotransmitters and neuromodulators can act throughout the brain to enhance neuroplasticity, make us feel better, and help keep us going. Exercise is known to help with learning and memory. In return, emotions and neuromodulators can facilitate motor learning. Sometimes, the hardest part is to just get started.

Emotional enhancement of learning and memory

As you know, both positive and negative emotions can enhance learning (for a recent review, see Tyng, et al., 2017). It's why we find it easier to remember emotionally charged events in our lives. In everyday life, emotions can facilitate or hinder learning depending on how one manages their feelings. For example, a bad outcome or a difficult situation can be used as a motivator.

As explained in this book, the enhancement of learning and memory occurs through the activation of neurons in the amygdala and the prefrontal cortex (PFC), acting on neurons of the hippocampus.

This famous hippocampus, not only proudly bears the shape of a seahorse, it is truly a stallion of neuroplasticity as it is responsible for the formation of anterograde memory, aka new learning, and the retention of long-term memory. The amygdala and PFC contribute to the enhancement of learning by increasing attention to salient stimuli.

Interestingly, baseball players were found to have greater connectivity between regions involved in motor skills and cognitive control, when measured during rest (Sie et al., 2019).

This suggests that training improves connectivity not only between motor

regions but also with higher cognitive functions which likely contribute to improved gameplay.

Chronic stress impairs synaptic plasticity via an overactive HPA axis (Hypothalamic-Pituitary-Adrenal), leading to the secretion of the stress hormone called cortisol. Exercise can protect against stress by increasing the protein mTOR (target of rapamycin) in brain regions like the hippocampus and amygdala (Lloyd et al; 2017) and by decreasing cortisol levels. Dopamine can act with mTOR signaling to offer some antidepressant effect while promoting LTP (Zhang et al., 2017).

Who needs antidepressants when calisthenics works like a charm? Most athletes in this sport seem to have more similarity to happy drug junkies than with depressed people; it is probably the result of an excess release of serotonin in their bodies.

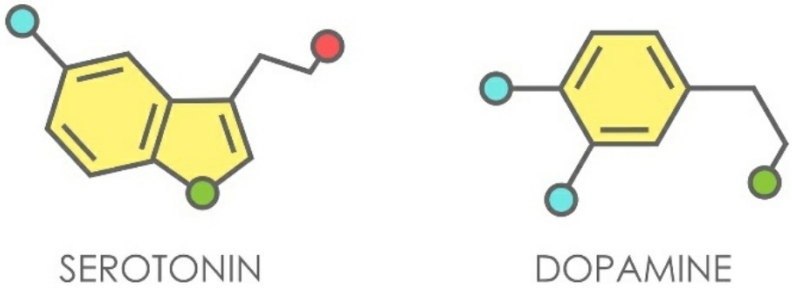
First, allow me to explain to you more about this molecule.

Dopamine

Dopamine impacts motor learning in different ways, including enhancing neuroplasticity, increasing motivation, and motor control. This brings me to question myself whether, as a baby, I was raised with dopamine in my mother's breast-feeding milk or of my brain just overproduced it naturally.

However, there are two groups of dopaminergic neurons in the brain; those of the mesolimbic pathway involved in reward processing and those of the nigrostriatal pathway involved in motor control (reviewed in Liu and Kaeser, 2019).

Dopamine can be released throughout the brain to act on a variety of receptors and culminating in different effects.



Mesolimbic dopamine is released when anticipating a reward, thereby playing an important role in motivation. It is also released when receiving an unexpected reward or novelty.

As an Epicurean myself, I always have always prioritized pleasure in my life. After applying mindfulness practices as one of my favorite biohacks, I have discovered that it can break out the habit-forming mindset and signal the brain to digest tons of information associated with the reward outcome. Hence the prediction error hypothesis of dopamine release, which implies that it is released when unexpected.

Dopamine plays a pivotal role in learning by facilitating neuroplasticity.

The motor cortex receives a strong dopaminergic input, playing an essential role in motor skill acquisition and plasticity (reviewed in Bazzari and Parri, 2019). Depending on the circumstances, dopamine can either facilitate LTP or LTD, influence neuronal excitability or modulate gene expression in the motor cortex (Hosp et al., 2011). In younger adults, it was shown that successfully learning a skill is associated with greater plasticity in the motor cortex, as opposed to repeating the same movement without receiving positive feedback, whereas staying idle led to a reduction of plasticity (Mawase et al., 2017). Forget potato chips on the couch, constant movement is key! And if you ever lack the motivation to move your body often, know that nigrostriatal dopamine can play a major role in vigor and motivation.

The release of dopamine in this pathway correlates with activities involving the use of many muscles simultaneously, along with the activation of the associated sensory receptors from the muscles, joints, and skin. Parkinson's disease selectively impacts the dopaminergic neurons involved in movement

control.

Doesn’t that sound like Calisthenics?

I realize that I am bringing a lot of data from animal research, and I totally hear you out there, judging fast that this book may be a bit avant-garde for the science. That said, the research that I am referring to is well-established, it just has yet to be as widely accepted in the human world, and someone has to start the process!

Let me now try to stimulate your neuroplasticity, by explaining to you the endocannabinoid story, which is still very recent, but I firmly believe it.

Endorphins and endocannabinoids

We cannot talk about exercise without mentioning endorphins. They are classified as endogenous opioids and believed to mediate the “runner’s high”, although some would now argue that endocannabinoids are responsible for it (see Hicks et al., 2019 and Fuss et al., 2015).

Nonetheless, endorphins and endocannabinoids are secreted during aerobic and anaerobic exercises, in a volume and intensity-dependent manner. While endorphins are mostly secreted during anaerobic exercises, any intense exercise can trigger their release. Both are thought to act like a pain analgesic, making one feel better during and after exercise. Calisthenics, and more specifically, Statics are based on anaerobic exercises. Again, observe Calisthenic Athletes, you’ll admit that they look they’re “high” after achieving a new skill. Speaking from personal experience, I noticed this opioid effect very frequently; became addicted to it and it became one of the reasons I decided to write this book.

There is some evidence that supports the role of endocannabinoids in mediating the exercise-induced enhancement of learning and memory (Wang and Han, 2020). The endocannabinoid system may also be involved in mediating some of the effects of lifestyle changes on our metabolism (Marzo and Silvestri, 2019).

I understand that this part of the chapter is a bit complicated, but so is the brain: The most complex organ in the human body, and the universe, with several trillions of synapses!

Learning can occur at the level of the synapses, circuits, and systems, and neuromodulators can act on everything, either enhancing or hindering plasticity.

Recently, I read in publications that several medications could target the neuromodulator systems, and, therefore directly affect brain plasticity and sensory processes.

Imagine if these chemical substances could be used to target sensory plasticity in healthy adults… Once paired with training, they could reverse the aging process. Our brain's ability to rewire itself is not just limited to learning new skills; it can also be utilized in regenerating and reversing the body's biological clock: in other words, hijacking our body clock!

Epigenetic Clock

The scientific means of measuring your true body age is by performing a biochemical test that measures DNA methylation levels in your body. This test is known as an epigenetic clock and is one of the truest depictions of the state of a body. It accurately reflects the state of health of your tissues and organs.

The epigenetic clock makes it possible to accurately estimate your chronological age, in other words, our "true" cellular age .

Obviously, this test could be useful for the knowledge of what causes aging and, eventually what would be required to reverse it or avoid it altogether.

The science of tomorrow is interesting! Let's pretend that we will be able to combine the results of the epigenetic clock with the use of neuromodulators that target neuroplasticity. This may be the most effective biohack to reverse your body clock!

It's a whole new form of biohacking, where you are taking advantage of a biological process in your body and making yourself 'younger'. Not just physically or mentally, but your health and mindset will be like your younger self.

The Importance of a Healthy Mindset

Having understood the potential of neuroplasticity, it is also important to understand the importance of having a healthy mindset. To live a high quality

of life, you must make your body as well as your mind, as healthy as possible. To look at it bluntly, it is the mind that controls the body which is what is so powerful.

In other words, if you are physically active but are facing depression, anxiety, or any other mental issue then you will neither be healthy nor happy enough with yourself. However, if you have a positive mindset, despite having an unfit body, you will still be better off than the previous case as you will still be satisfied with yourself and can easily improve yourself. This demonstrates just how powerful our minds are.

As mentioned before, the mental state of an individual dictates a lot about them. Even if a person has succeeded in life but lacks mental peace, they will never be able to feel fulfilled or satisfied. A clear example of mental strength can be demonstrated by monks. They free themselves of earthly tethers and instead, focus on meditation and conditioning the mind. They often live in seclusion from the rest of the world and have no concern for worldly things that determine one's success and accomplishments, going by a materialistic definition. Despite the lack of all luxury, monks live extremely content lives. The same cannot be said about most of us who live a comparatively comfortable life with numerous facilities and luxuries yet still struggle to find mental peace and contentment.

If one trains the mind, they can even master it to an extent as to gain control over various bodily functions. For example, try holding your breath for as long as you can. Most people can hold their breath for a little over 30 seconds before gasping for air. What if I were to tell you that the longest duration for a human being to hold their breath underwater is around 22 minutes!

Well, what is the difference between an average human being and the person who held their breath for 22 minutes? Does he have a special set of lungs? Does his body store extra oxygen in reserve? The answer to all these questions is a resounding no! Holding your breath has little to do with oxygen because our body has enough in reserves to allow us to hold our breath for longer than 30 seconds. . It has more to do with reflex and our mental state. Our body is used to constant rhythmic breathing at all times, even when we're asleep. Our attempts at consciously stopping breathing induces panic and stress which speeds up our heart rate, which in turn increases our pulse and our body starts consuming more oxygen which leads to us gasping for

breath after a short while.

Swimmers can train their lungs and increase their breath-holding ability but the people who set underwater breath-holding records have truly gained mastery over their minds. They train their brain to not feel panic in such situations. They are also able to meditate and calm themselves which slows down their heartbeat considerably because of which their body consumes far less oxygen. They are also able to control their respiratory reflexes, which explains why they can last so many minutes underwater without breathing.

Do you understand now? All of this, just by having control over your mind. If we can train our brains to stop breathing for so long, just imagine what else we can do by gaining even more control over it. What you thought previously impossible is now within the realm of possibility – if you just think about it.

Athletes around the world practice the healthy mindset. This is because training your muscles up to a certain point means that your body will be capable of performing to a certain limit, but will it perform up to that mark each and every time? Ask yourself this question, how many times have you woken up and just not felt like getting out of bed or not completing your exercise routine? Does this mean that your body has lost its ability to perform those actions? No! It simply means that you are not in the right state of mind to do something. Having a healthy mindset will not only enable you to achieve your goals but also provide you with a different outlook on life altogether.

Gifted and talented athletes cannot always deliver high-level performances in world-class competitions due to the mental pressure they face continuously. Athletes who adopt the winning mentality are able to persevere and stand out from the competition.

Irrespective of the situation you may be in, it is your attitude towards that situation that dictates the outcome you will get. In most cases, the greatest challenge isn’t overcoming physical limitations, but overriding our restricted attitude towards those limitations. Having an upbeat and positive attitude allows you to look at life in a better way, it can be the difference in you seeing a setback as a failure or a learning opportunity.

It is always those who have a healthy mindset that can excel in life. For instance, Thomas Edison had to conduct over 9000 experiments before he

could perfect the invention of the light bulb. It took him even greater attempts (around 50000, to be precise) to perfect the alkaline storage cell battery that we now use in our lives. He did not give up after facing setbacks, instead, he trained his mind to identify them as learning opportunities.

“I have not failed. I’ve just found 10,000 ways that won’t work” – Thomas Edison.

This well-renowned quote of Thomas Edison reflects his mental strength and the mindset that he adopted which enabled him to do achieve that was never done before. His invention of the light bulb is among the biggest and most important contributions in the field of science and before he succeeded, it was considered to be impossible. So, why do you keep making excuses that keep you stuck in a restricted mindset?

In order to cultivate a healthy mindset, it is very important to identify your goals and commit to them no matter how impossible the odds. This will help you visualize your endpoint and will keep you motivated throughout the journey. A realistic goal allows you to stay focused on the task and even if you begin to waver, a little positive self-talk is all you need to continue believing in yourself.

That calisthenic movement you want to perform, that new language you want to speak, that killer summer body you always wanted to have, those hardcore sports you wanted to master … all of this is within the realm of possibility as long as you cultivate the right mindset. Even scientific knowledge demonstrates that there is nothing stopping you from realizing your goals. The only thing stopping you is you. If you just begin to adopt a healthy mindset, you will begin to achieve your list of milestones.

I do not expect people to jump fully right into this because I know that it’s not easy. It requires strict discipline and hard work to conform to a schedule and to follow instructions, but it is still possible. I suffer from ADD which makes it near impossible for me to follow instructions and stick to a strict schedule. I am not going to lie; it was bitter work for me, but I was able to transform my mind and body. This, I was able to do by adopting a Growth Mindset and once I put in just a little hard work, the results were phenomenal.

Many people are unaware that they have a fixed mindset. So let me explain to

you the differences between a fixed and a growth mindset. I want you to read this carefully and reflect on whether you possess any of these characteristics. Do you aspire to find something you're good at? Do you pursue things and tasks that restrict you in your comfort zone? Do you get uncomfortable when you see your peers get ahead of you? Do you get tired of people giving you advice and feedback?

If the answer to these questions is yes, then you have adopted a fixed mindset which is hindering your progress. People who possess a fixed mindset have a rigid image of themselves and a defeatist mentality. They usually accept their limitations and use this line of thinking as an excuse to not move on. They think that it is impossible to achieve a certain milestone because they are not creative, or intelligent, or skilled enough. They teach themselves to accept that they're simply not good at facing challenges because there are other things that they may be good at. Thus, they impose a boundary or limit on themselves and assume that since they are already good at doing certain things that are within their comfort zone, that it is impossible to learn anything different. Children who have a fixed mindset just accept that they are not the brightest in the class and never learn to challenge themselves.

Watching others excel in academics or extracurricular activities instills a sense of jealousy but it does little to motivate them to increase their efforts. Instead, they resign to their self-imposed limits and accept that they are just not capable of doing those things. Many adults utilize the same mindset in real life when they see others progress and think to themselves, "Well, I just can't do that because I never have." These people with a fixed mindset despite being biologically similar to their peers, the only difference they have is the internal monologue they use to restrict their growth. They do not take life as a challenge and instead shy away from charting into unknown territory. They believe their potential is always predetermined and that they are either good at something or not, that there is no in-between. They stick to what they know best and to what they are good at which is why they are never able to move on in life. They can never try anything new because if they do try it, they will not immediately be good at it because it's not in their comfort zone, and that means they'll never get good at it.

By thinking in binary terms, they see things in black and white; they can either do something or they cannot. Thus, failure to do something defines the limits of their efforts. They only go as far as to try something at an

elementary level and if they fail at it, they immediately call it quits. By contrast, people with a growth mindset take failures in stride and learn from it. They also appreciate any and all forms of criticism regardless of it being negative or positive. In hindsight, they benefit more from negative criticism as it provides better chances for improvements. They have a perspective of taking life as a challenge which is how they learn new skills and achieve milestones. This is perhaps the greatest difference between someone who has a fixed mindset and someone who has a growth mindset. Someone who adopts a growth mindset takes life as a challenge and does not enjoy working within their “comfort zone”, they enjoy challenges and embrace them head-on without backing off. It becomes second nature for them to tackle challenges and to keep making improvements, no matter how small. They are addicted to learning new things and never let it rest. Even if they face setbacks, they learn from them and simply change their approach in order to succeed.

I usually have a very short attention span due to ADD but I have been able to keep myself organized by adopting the growth mentality. I began persisting in the face of setbacks and welcomed every challenge that came my way. I became so used to it that with time I started to look for things that would challenge my capabilities and that enabled me to unlock the true potential of my mind and body. It is true, that, at first, I struggled to perform certain exercises with my body, but I kept on persisting and putting 100% of my effort into it. I kept telling myself every day that I must put more effort into reaching my goals and that I was getting really close to achieving them. Many people criticized me, but I only paid heed to positive criticism and learned from it. I used it to motivate myself, the naysayers only gave me more of a reason to do it because doing it would prove them wrong. As a result of the mentality that I had adopted, I was able to reach my goals and even excel at them with time.

You see? Having a growth mindset is a key part of working effectively, even more so with ADD. If I can do it with ADD, then surely anyone can do it. The very first step to changing your mindset is changing your internal dialogue. It should reflect a growth mindset where you embrace all the “challenges, criticism, struggles, and setbacks.”

Let me give you another example of a growth mindset of an individual named Leah Culver. Leah recounts her story of getting in shape by starting off with

running. She was not entirely starting from scratch as she was used to jogging before, usually once a month just to stay active. This time she started taking this hobby a bit more seriously. At first, she only set a goal to be able to run a decent amount and her first run was only 2 miles at 10 minutes per mile. Admittedly, despite being pretty slow, it was good enough to keep her motivated. As a result, she jogged a little more that week and kept her practice sessions up for a few more weeks. As she began to enjoy jogging, she set goals for herself to be consistent with it and to never quit.

She knew that she was not going to be that fast in the beginning, so she focused not on the speed but on staying consistent. She started running four to five days in a week and taking lesser off days from runs in between. Even though she only made marginal improvements that were hard to notice, she stayed committed to her goals. She used to have good days where she ran faster than before and enjoyed every bit of it, and she also had her fair share of bad days where she just felt like giving up and not running at all. Regardless of these conflicting feelings, she persevered and after just five months of taking up running, she completed a 5 km long run which she finished in about 28 minutes.

After a year of running, she signed up for a marathon and hired a running coach. She now identified herself as a runner even though this was never her initial goal. This is all because she never quit and kept growing. She adopted a growth mindset and it allowed her to overcome obstacles in her life. As a result of this change, her body also adapted to the change and learned new things much faster than usual. Sticking to her goals and having a healthy mindset allowed her to explore the hidden potential in her body. She was able to physically perform at levels she had never even thought were possible.

It is basically the willingness to take the steps that are within your control, despite the challenges, hurdles, and obstacles that promote true growth. Using the setbacks, criticisms, and failures as a way of learning new things that would enable you to reach your goal truly defines a growth mindset. There are certain tools that help, along with a growth mindset, this includes adopting a healthy diet, some simple biohacks, and lots of recovery time, but moreover a real and strict routine plan with discipline and exercise. With this in mind let us move onto the next chapter.

Chapter 2: Science of Isometrics

What are isometric exercises?

Isometric exercise activates and engages various muscle groups in the body without requiring joint movement. These movements flex the muscles without expanding or compressing its length, unlike conventional exercises, while still stimulating the muscles. This allows you to target just about any muscle group without having to move the joints. There are no twisting, pulling, or pushing movements involved in these exercises, which is why it is also compatible for people who are either not very athletic from the get-go or have joint problems.

The word "*isometric*" has Greek origins with two components: *isos* (equal, identical) and *metron* (a measure). The most distinguishing feature of isometric exercises is the intensity with which the target muscle is contracted.

Isometric exercises are usually practiced by pushing or pulling an immovable object – such as a wall or the floor – or holding onto a weight for a set period of time. These types of exercises first gained popularity when strongman Alexander Zass brought this system of training to Britain in the early 20th century. The story behind Zass is unbelievably interesting and strange, but very true. He first got into isometrics while locked up in prison. Zass used to perform strongman stunts in a circus until he was incarcerated during the First World War. Being much stronger than the rest of his in-mates, he wasn't allowed to leave his cell and was chained to a wall to restrain him. Instead of giving in to the restraints, he used them as an excuse to increase his strength further. Alexander Zass pulled and struggled against the immovable chains each day, as a result of which he acquired strength, until one day he broke free from them. He escaped the prison by literally bending the prison cell bars and using them as hooks to scale the walls – talk about insult to injury!

His great prison escape popularized isometric exercises around the world.

Isometric exercises are very beneficial for the body as they are geared towards strength training, more so than traditional forms of dynamic exercises. This is one of the reasons why Static Calisthenics is one of the best and most advanced forms of isometric training. It not only stimulates

strength, but also stimulates muscle growth while also toning the body.

Static in Calisthenics

Static, often referred to as static holds or isometric holds, make up the majority of exercises in calisthenics. While calisthenics also utilize a combination of dynamic exercises, the essential aim is to reach and perfect those movements. Calisthenics are not defined by the number of reps, rather they are a number of isometric holds, such as the planche. These positional freezes require incredible balance and focus and engage several muscle groups in the body without any contractions or angle changes in the joints.

People who perform calisthenics exercises usually possess incredible core strength and often have incredible durability. These static holds in calisthenics also serve as training for the brain, because being able to perform them requires a certain kind of mindset from the person which requires actual commitment. A positive healthy mindset and strong will are two pre-requisites to get started (and excel) in calisthenics. Only after strenuous training, countless hours of practice, and unwavering willpower, are athletes able to acquire perfection and reach the level of mastery in their field.

The concept of calisthenics will be better explained with much more detail in the following chapters.

Addressing Common Misconceptions

Isometric exercises are often compared with other types of exercises, such as isotonic and isokinetic; often confusing people new to the idea. Where isometric exercises deal with keeping the “same length” of a muscle, isotonic exercises deal with the “same tension” in the muscle so that the weight on your muscles remains constant. Another type of exercise includes isokinetic movement, which deals with the “same speed” of muscle contractions throughout the workout. Both – isotonic and isokinetic – involve movement and contraction of the muscles through various ranges of motion, which is why they’re often referred to as dynamic exercises.

There still exists a lot of misconceptions among people regarding the concept of isometrics. Let us look at them and address some of the most important ones.

1. High blood pressure; one of the side effects of isometrics

Isometric exercises involve a lot of holds or pushing/pulling immovable objects for a certain amount of time. The growing tension in the muscles causes blood to build up during the exercise and is suddenly released in a rush as the contraction is released. This explains why so many people believe the misconception that isometrics cause high blood pressure, even though regular exercise also has a similar effect on the muscles and blood. If you're concerned about the 'blood-rush' during isometric exercising, you can minimize blood pumping pressure by practicing proper and relaxed breathing techniques.

2. It only increases strength at that hold angle

The muscles in our body, although made up of different tissues, behave as one big collective organ. This means that it does not have any sections or areas that behave differently compared to others. Muscles do have ligament tissues which can be engaged individually, but they do not contract in sections. Any sort of isometric or dynamic exercise usually activates the whole muscle.

The main difference between both types of exercises is in how they make your nervous system behave. During dynamic exercises, our nervous system is engaged for a larger range of motion to make them more efficient, whereas, in isometric exercises, the nervous system is mainly engaged in trying to retain balance and fatiguing the muscles to increase strength. The "burning" sensation is also not as intense after an isometric exercise which may give the illusion that the muscles haven't been fatigued during the workout. All of this often leads people to believe that isometrics are only effective in building strength at a particular angle of an exercise and does not contribute to overall muscle strength.

3. No muscle growth, only strength

First, it is important to establish that muscle size and strength are not mutually exclusive. Having one does not mean that you do not have the other. There are two forms of muscle growth usually relevant to working out: myofibrillar and sarcoplasmic muscle growth. In myofibrillar muscle growth, the muscle gets stronger by gaining protein density and by increasing in size. However, in sarcoplasmic muscle growth, the amount of water and glucose around muscle cells increases which in turn, increases its endurance, without

increasing much strength.

In most cases, powerlifters, fighters, and martial artists have dense muscles which are an indication of myofibrillar growth. On the other hand, bodybuilders have enlarged muscles, an example of sarcoplasmic muscle growth. This doesn't mean that they lack strength because myofibrillar growth is one of the pre-cursors towards building sarcoplasmic muscle growth. Isometric exercises are incredibly useful because they stimulate myofibrillar growth, thus increasing strength much more quickly and efficiently.

4. Does not bulk up a person

Muscle size increases by pumping the muscles and that happens by increasing the number of exercise reps. Since isometric exercises do not consist of any muscle movements or muscle pumping, they do not contribute much to sarcoplasmic muscle growth. The traditional training method of this type of exercise uses time to increase strength rather than repetitions.

There are certain alterations to traditional isometric practices that stimulate both types of growth. Calisthenics is one such practice, as it complements isometrics holds with dynamic movements.

Benefits of Isometric Training

It is true that muscles respond best to concentric and eccentric movements (and contractions), but there are other ways of eliciting a hypertrophy response. One of these is isometric training, which induces the growth of muscles while boosting strength. If done right, isometric training can contribute greatly to improving the quality of your life and can help you reach your fitness goals.

Builds lean muscle mass effectively

Muscle growth is most efficient when they go through anaerobic metabolic fatigue. This can be achieved by engaging in prolonged periods of muscle exertion which is how they suffer fatigue. Simply lifting weights is not enough to trigger muscle growth; the ultimate aim is to tire out your muscles as much as possible. This is easier to do with isometric training as they are great at causing fatigue.

Isometric exercises use maximum resistance in position freezes, which tires you out much quicker as compared to drawing workout sessions with smaller weights for a longer time and minimal growth. The lack of rests in-between reps of isometric exercises puts tremendous strain on the muscles, the longer you hold your position, the better.

For example, imagine using low weights to do bicep curls till failure; it will take many reps for your muscles to tire out. Now imagine doing the same exercise using heavyweights such as a fridge or a piece of furniture; your forearms and biceps will reach muscle fatigue much quicker. So, isometrics are freakishly effective at building lean muscle mass.

Builds strength faster

As discussed previously, the types of muscles that are built using isometric exercises are much more denser and stronger than those built by any methods, including dynamic exercises. This is due to the stance holding approach used in isometrics and their ability to engage larger muscle groups more efficiently.

The targeted muscle can activate nearly all the available motor units. A motor unit is basically made up of a motor neuron and skeletal muscle fibers, innervated by the motor neuron's axonal terminals. Activating all the motor units is usually much more difficult to do with conventional techniques but is relatively easy, using isometrics.

This has been proven by many several studies, the best example of research is the work by Hettinger and Muller. They conducted a study which found that just a few brief periods of isometric tension – 6-second sessions at two-thirds of maximum capacity – increases strength by about 5% each week. This is a considerable increase and build-up in strength when you compare it to what conventional methods can achieve.

Protects the joints

One of the biggest issues in weight training is that it requires proper form to gain maximum advantage from the exercise. However, that is not the case in isometric training since it does not involve any joint movement. Resistance training, as used in weight training, is dangerous in and of itself because it can easily cause grave damage to the body if proper form is not used, or if the weights are too excessive.

The dynamic movements in these types of methods cause wear-and-tear on the muscles and the joints which increase the danger of having arthritis later. The risk associated with having a serious injury increases in the case of dynamic movements that utilize momentum and inertia, both of which can easily exceed a person's limitations.

In comparison to other "conventional" exercises, isometrics are much safer since they do not involve dynamic movements, which results in them being much safer. If you are suffering from an injury or pain which restricts you from exercise, isometrics may be the best option for you. If you have a condition where the doctor has prohibited you from movement, isometrics may be better for you. Even if you have none of these issues and you just want to avoid any injury while working out, isometrics is still the best way to go.

Weight loss

Isometric training has been shown to burn calories and contribute to weight loss, which makes it one of the most valuable exercises in any weight loss program. You might ask, how do isometrics burn as many calories without any movement?

Well, the answer is, isometrics engage a large number of muscle groups. When you activate and use your muscles, regardless of their range of motion, they generate a large amount of heat throughout by consuming calories. The longer you hold the position; the more energy your muscles consume.
As a bonus, athletes and fitness enthusiasts experience a marked drop in blood pressure and heart rate.

Cardiovascular health

Isometric exercises deal with contracting muscles at a certain position and tensing them to build strength. It might seem too good to be true at first if I told you that isometric exercises can improve cardiovascular health, but there is actual science behind it.

It may seem hard to wrap your head around the idea that a motionless exercise could play an important role in cardiovascular health, I will prove that it does.

The action of squeezing and holding muscles in a single position constricts

the blood vessels temporarily and then restores flow when you let go. This gives the blood vessels and the heart a more effective workout than conventional exercise ever can.

This explains why people who practice isometric exercise techniques rarely suffer from blood pressure problems. In fact, several types of research point to isometrics being much more effective in regulating blood pressure compared to prescription medicine. It doesn't require someone to practice it rigorously every day, rather some studies even suggest that just training as few as 3 times a week is enough to observe a 14.9-point and 12.5-point drop in diastolic and systolic pressure, respectively.

Isometrics and Their Applicability

There are essentially two types of isomeric exercises you should know: yielding isometrics and overcoming isometrics. Yielding isometrics deal with lifting a load and holding it in a certain position to resist the eccentric forces that follow. On the other hand, overcoming isometrics deal with trying to move an immovable object. They do not necessarily have position freezes and instead, tire the muscle out by trying to move the immovable object. Overcoming isometrics can be extremely taxing on the nervous system which is why you should not overdo them.

Both types of isometrics can be practiced by anyone who wants to avoid injury and reduce the strain on the joints. People who want to gain leaner muscles also leverage these types of exercises, which they do by incorporating calisthenics. The static movements in calisthenics are some of the most advanced forms of isometric exercises as they challenge not only strength and stamina, but also focus, balance, determination, and flexibility. In addition to this, using an isochain to practice and apply the techniques of isometrics allows athletes to perform heavier and more progressive resistance training. This eliminates the need for a fully equipped gym; therefore, making it more convenient than traditional methods.

Chapter 3: Physical Activity and its Effects on the Brain

Although the most important step in becoming healthy is to first adopt a healthy mindset, it is closely followed by exercising the body. While you might have heard from many people that diet contributes greatly to fitness, it is physical activity that truly helps one in staying fit and maintaining their physique. Physical activity activates targeted muscle groups and helps burn stored energy in the body.

We are told from our childhood that exercise is good for the body, and this is every bit as true as they say it is. Our bodies are designed in a way that to perform certain functions it needs energy. It gets this energy from breaking down food into energy units called calories. Our body burns these calories while performing routine functions such as breathing, digestion, nervous system communication, movement, and more. But, among all these functions, it burns most calories while performing physical activity and cognitive functions

It might be surprising to know this, but our brain and its functions are responsible for the consumption of around 20% of the total calories burned in our body each day. Let us look at it another way, let's say you require the consumption of 2500 calories in a day, out of those 2500 around 500 calories will be utilized for brain functions and its activity.

Of course, this number is only a close estimate, many studies suggest that this number can not only change but also increase. Whenever we challenge our brains to work harder and push it beyond its usual working capacity, we give it a bit of a 'workout' and as a result, it consumes more energy.

Kudos: Neuroscience Calisthenics concept!

Significance of Calisthenics

Believe it or not, two activities that will increase your brain's calorie-burning capacity *and* help you achieve the lean and toned body you're working so

hard for are imagining, visualizing attainment of your goals, and exercise!

Studies suggest that complex exercises are much better and effective than simpler exercises. Physical exercise that not only engages your muscles but also challenges your ability to balance, move in different directions, and at varying speeds force your mind to work harder. It gives your mind an opportunity to multi-task while engaging multiple muscle groups in your body, thus increasing motor control as well as the conventional mental approach. That is Calisthenics!

To tone your mind and your muscles there is one total body workout concept that you should become familiar with, the world's first human optimization program called Neuroscience Calisthenics. Let me explain this concept a bit more.

On average we consume somewhere around 2500 to 3000 calories a day. These calories are present in the food we eat and are extracted when it is broken down in our stomach. They are usually stored in our body in the form of fats, if not required immediately. When we do not exercise, we do not present our body with a reason to burn off those calories, so it keeps storing them in the form of fat under the skin. This can cause serious health problems for an individual if it goes on for too long. A failure to perform exercises increases the risk of heart attacks, high blood cholesterol, diabetes, and even cancer.

Exercising regularly creates a healthy mindset as it aids in adopting discipline and routine required for being healthy. It also helps in reducing fat and activating all muscle groups in our body which ensure peak health. You really can’t make an argument against exercising because everyone knows its benefits; improves health, burns fat, reduces weight, and so on. Yet most of us skip working out due to laziness or procrastination (whatever you want to call it).

When we think of exercise, typically, the first thing that comes to mind is hitting the gym and lifting weights, but this isn’t the end-all and be-all of achieving your fitness goals.

If you don’t have time to go to the gym, opting for calisthenic strength training sessions can be an excellent alternative.

Calisthenics has made a big comeback in workouts around the world. It uses the resistance of your own body to increase flexibility, build strength, and burn calories.

Let’s find out more!

What is Calisthenics Training?

Calisthenics strength training consists of various movements that target large muscle groups to achieve physical improvement and gain strength.

The exercises are mostly performed rhythmically and with minimal or no equipment or machine while engaging the entire body.

A calisthenics exercise program focuses on the development of flexibility, speed, and strength rather than building a large block of muscles (although that is also fully attainable).

Here are the top benefits of calisthenics strength training:

Improved core strength

Conventional gym workouts utilize your muscle groups in isolation. For instance, when you perform a leg press, you position yourself on a machine that isolates the leg muscle.

But when you perform a calisthenic exercise for legs, such as jumping jacks, deep squat lunges, deep squats, etc., your entire body has to work to maintain balance.

These exercises force the core muscles to engage in stabilizing your lower body, turning every rep to a core exercise, resulting in improved core strength.

Burn calories

Weight training exercises are a great way to build muscles but don't typically burn as many calories as HIIT or cardio workout.

Calisthenics strength training, on the other hand, is highly effective for burning calories while improving muscle strength at the same time.

You must continuously change your body position when performing calisthenics workout, which keeps your heart rate up and burns more calories per session.

Time Efficiency

Let's face it, going to the gym is time-consuming (let's call it what it is: a waste of so much time!). You have to wait for the equipment, change weight plates, and switch handles, that's half your workout session!

Calisthenics strength training saves you all the hassle. You don't need equipment or machines to workout, you only need your body - so that you can exercise in the comfort of your home.

And here's the best part: you can perform sets after sets without any delay and maintain a high level of intensity in your working sets, resulting in efficient and more productive workout sessions.

Conclusion about Calisthenics

Calisthenics workout allows you to build endurance, improve flexibility, increase muscle and tone, and more.

It frees you from the workout shackles that many gym-goers find themselves stuck in and saves you a lot of time, money, and hassle.

Calisthenics strength training provides you the freedom to train your body anytime and anyplace and helps maximize the potential to develop endurance and strength.

Benefits of Exercise and its Effects on the Brain

Exercise does not necessarily mean lifting heavyweights in the gym. Any type of physical movement that burns body fat by consuming energy may be referred to as exercise. These include, but are not limited to, doing sports, cycling, jogging, running, swimming, calisthenics, acrobatics, and many more. What is necessary is that your primary objective must be to stay fit and to keep yourself active. Once you start thinking that way and start exercising regularly you notice small (but healthy) changes in your life. A healthy and active approach means that you will start taking the stairs instead of the elevator whenever possible, walking to places instead of driving if it is nearby. A change in your mindset will bring about a change in your lifestyle and once that happens, you will practically crave physical exercise.

Exercise also serves as an important stress reliever which is why it is recommended to workout daily even if only for a little while. Consistency is what matters most in exercising, because at the very least you're keeping your body active. This improves bodily functions and further promotes health. Since the body is burning up more calories while staying active, this means that our metabolism also increases considerably, and the stored excess fat is burned off much faster. The muscles are used much more in an active body which builds more lean muscle mass. This in turn burns up more calories, a highly effective way of burning off the stored fat.

Exercising also requires the person to perform several physical movements that require considerable excursion and focus. This allows us to get our mind off everyday worries and instead concentrate on the exercise at hand. The performing of repetitive but complicated exercises serves as a means of meditation and self-reflection. It gives you the mental peace you need to take a break from the tension and stress of everyday troubles and focus on you. That is one of the reasons why people who exercise regularly possess incredible mental strength and resilience. You need considerable discipline and will-power to stick to regular exercise. Once you start it and get used to it, it becomes easy to stay focused, but it is that first phase of a continuous effort that presents the biggest hurdle. After someone overcomes these challenges, the benefits from it are numerous.

I'm going to be honest, in order to discipline oneself, it takes considerable effort. It is not necessary that one day you decide to get fit and healthy and from the next day, you will start going to the gym and will keep going there regularly. No! You may not develop these habits in one go but if you shift

your mindset, you will notice the change nearly instantly. You will start making conscious choices for your own health and will work out as much as you can in the beginning. You will start avoiding unhealthy junk food and eat healthily. In addition to this, you might see yourself going for a run every now and then. But, all of this will start, only if you have made that shift in your mindset.

Another beneficial aspect of doing exercise is that it helps regulate our mood. Our mood is primarily controlled by a mix of chemicals that are released by our brain in certain situations. It all boils down to the glass-half-empty or half-full perspective again. In any given situation (good or bad), our brain can either focus on the positives to be happy or at the negatives to be sad. Our perspective at how we look at something heavily influences our mood. Thus, being ready for change and growth automatically hardwires the brain to not see the negative aspects.

Our brains are also trained to be happy whenever we successfully complete a task.

This is where working out comes into play.

Completing sets and performing an increasingly complex routine successfully gives us a sense of achievement and happiness. This in turn signals our brain to naturally release ‘happy’ chemicals such as dopamine, serotonin, and oxytocin that induce feelings of joy. Our achievements, no matter how small they may be, serve as a way of training and disciplining us and once we get accustomed to these small changes and exercises, we are ready to move on to the bigger ones.

But you have to take baby steps, as the saying goes. For beginners not accustomed to working out, it is better to start off with something easier. Cardio and bodyweight exercises are a good starting point toward achieving your fitness goals. Cardio exercises include jump rope, running, jogging, swimming, cycling, and even stair climbing among others. They are efficient at burning calories and increasing metabolism.

Moreover, cardio elevates the heart rate and increases body temperature temporarily as it burns calories to provide energy to the body. Cardio also falls under the category of exercises that utilize one’s own body weight which is why they produce less of a strain. They can even be used as a warm-

up exercise before starting the actual workout session. Of course, because of this reason, it strengthens not only one's muscles but also the heart and lungs.

If you are not a regularly active person, you may notice that running a few miles, or quickly walking up a flight of stairs, or skipping rope for a few minutes will leave you completely out of breath. This is because your body is not used to physical exercise and when you suddenly go through physical excursion, it increases its heart rate to provide more oxygen to the muscles that are being used. The body is not used to this process which is why it uses the oxygen available to it inefficiently. This is known as aerobic capacity. Your aerobic capacity increases as your body gets more and more used to rapid physical activity. Usually, people who do cardio have a higher aerobic capacity than those who only lift weights at the gym.

Regular exercise promotes a healthy state of mind since it ensures you never lose sight of your goals you want to reach, the body aesthetics you wish to attain, and the vision of the healthy lifestyle you want. It distracts you from negative thoughts and increases your overall focus. People who exercise regularly usually possess a great degree of will power and discipline. They can learn new things and skills relatively easily because of their disciplined lifestyle and growth mindset. They see everything as challenges and face them head-on instead of avoiding them.

When athletes start a new exercise, they're not able to get it right away and can only perform fewer repetitions and sets. They cannot immediately do a planche or a handstand, but this only serves as a challenge to them. Throughout their life, they have faced numerous challenges and exercises which they could not do at first but slowly progressed over time. They have seen themselves not being able to train with a certain weight but eventually got around to lifting it (for several reps, no less). They are so accustomed to growing, to beat their personal record, to break their limits that they take anything and everything as a challenge, and overcome it. They can face these challenges through discipline, practice, and most importantly by adopting a healthy mindset in life. THAT is their secret and that is how you can do it too!

Now, among different physical exercises the one that I think stands out most is calisthenics. These exercises do not rely on any heavy weights or equipment and only utilize a person's own body weight. It consists of a

variety of different movements that are designed specifically to target large muscle groups and to activate almost the entire body. Performing these exercises often requires rhythmic repetition and can sometimes also be performed with the help of overhanging rings or overhead bars. The difficulty of these exercises varies depending on the number of repetitions and differing intensity.

One of the benefits of calisthenics is how it does not require any heavy equipment. You can even perform calisthenic exercises at your home as it requires only your own body weight to target different muscles. It is more effective than normal gym exercises since it engages multiple muscle groups in the body in each exercise. Contrary to gym workouts it consists of no isolation movements of any one body part and instead employs movement from various joints of the body. These exercises take advantage of the simple phenomenon of gravity to create, leverage, and put tension on the muscles. Some examples of calisthenics exercises include push-ups, pull-ups, squats, chin-ups, muscle-ups, and many more.

Another major advantage of calisthenics is that it trains the body for higher flexibility as well as strength. There is less risk associated with calisthenics as compared to gym equipment because you are not required to lift heavy weights or hoist them dangerously over your head. It is dangerous to lift a considerable amount of weight over your own body because these exercises, if performed incorrectly, can cause serious injury to the spine, joints, or muscles. By contrast, calisthenics only involves one’s own body weight. The potential is to build strength despite not using any additional dumbbells or weight bags.

Beginner-friendly calisthenics often only involve a portion of a person’s body weight, such as push-ups, which is why they serve as a great starting point. As you keep doing it, your muscle groups become used to the tension and become much stronger allowing you to move onto much more difficult exercises where you lift your whole body weight such as pull-ups, chin-ups, and muscle-ups. People who have a certain mastery over these exercises go on to create their own unique routines and exercises where they perform a few mixed exercises that target each and every muscle group in the body. Increasing the rhythm at which calisthenics are performed also increases one's strength and explosive muscle power. To increase the challenge and difficulty, experts use elevated surfaces and increasing angles to perform

those exercises. This increases the percentage of bodyweight that is being lifted every time.

It is not uncommon for athletes who perform calisthenics to have a very aesthetic physique, mainly because they engage nearly every major muscle group in the body. Most exercises also develop considerable core strength as they lift the body in different ways, which explains why most people who perform calisthenics have chiseled abs and midsections. It is also true that there is a limit to how much muscles can grow by performing calisthenics exercises because there can ever be so much resistance provided by your own bodyweight but that does not stop people. It only gives them an opportunity to be more creative in their workouts and challenge their body in different ways. You can increase your range of motion in any given exercise and go faster or slower (I've created a SlowMoCtrl technique that focuses on executing transitional calisthenic moves in the slowest possible manner to increase strength and coordination) depending on the way you want to challenge your own body. This not only serves as a way to provoke the body to adapt to different things but also the mind and its approach to try and come up with different challenges.

A large emphasis on this kind of exercise, apart from your own body weight, is in the form of movement you employ to target your muscles. In the gym, people rely on weights that are too heavy to lift effectively. As a result, they lose the proper form required to target a particular muscle group and only focus on getting as many reps as possible, which isn't very effective. With calisthenics, you really can't over-exert yourself because there's only so much resistance you can get, thus allowing you to maintain form and target the right muscles.

As discussed above, calisthenics really does improve the body as well as the brain. It consists of exercises that utilize movements that improve your balance and fine motor skills. It allows your brain to develop its control over different parts of the body. Workouts in the gym or with weights emphasize certain muscle groups over others because they focus mainly on the aesthetic appeal of the program. By engaging the whole body and involving each and every joint and muscle, calisthenics stimulates strength build-up and improves fine motor skills from the feet to the fingertips. It is this utilization of one's own body weight as resistance in combination with creative postures that ensure that the exercises are gentler on the joints and ligaments while

maintaining correct form and posture.

This is perhaps best seen in exercises performed by gymnasts. Whether they perform their routines on a pole, or on the ground by twisting and turning their bodies in mid-air, they exhibit not only great body strength but also phenomenal control. They have situational awareness of their body parts, allowing them to improve performances with pin-point accuracy and agility. Practicing calisthenics also gives you similar confidence and control in your body as it improves the body-mind connection enabling new neuron links to be formed in the brain and allowing you to learn new skills.

Mastering control over whole-body movements with Calisthenics is an achievement in and of itself. It boosts confidence and helps you develop a better personality. If you've got social anxiety, you can easily overcome it with the growing sense of achievement thus making it easier to communicate with people better. You start to open up more and start looking for more challenges. Your mindset changes and instead of running away from strife you see challenges as an opportunity to grow and improve yourself. The image you have of yourself changes and you think of achieving greatness. Perhaps that is why I wish to unlock the full potential of the mind and body to become the best version of myself that I can be.

As I walk forward in life with such high ambitions, I want you to realize an important observation, which is that mind and body go hand in hand. Training the mind is equally essential as is training the body and your growth and development are highly dependent on both. My aim of reaching excellence isn't driven by selfish reasons because I truly wish to guide others on the same path that I took so they can understand how they too can reach their maximum potential. I cannot say that I am at the pinnacle of my capability because there is still so much that I can learn, and I do not want to stop because I have come a long way myself.

My goals with this book are of high-altitude: if you use your mind to push your performance forward (with physical activities), then you will increase growth factors in the brain which make it easier grow new neuronal connections: That's the principle of Brain Plasticity!

No matter what level of activity you do or for whatever duration, any physical activity, as basic it can be, stimulates growth. This growth of new

connections takes place between cells in many important cortical areas of the brain which in turn has a very positive effect on mental health, boosting your mood, and inducing positive thoughts. This process is never-ending as proven by recent neuroscience studies which have clearly shown that our brain never stops learning. Then why do we stop learning and trying different things after a certain age (when no such ‘age bracket’ exists)?

Most of you simply ignore the full range of benefits of physical activities to the brain. Exercise affects the brain in many ways because the brain is a highway.

It is all about enhancing physical performance and maintaining a healthy life! Remember, that the only difference between good performers and great performers is that the latter know how to maximize their own strength and potential by training their mind and body together. That is what distinguishes them from everyone else. They train their body the same way that everyone else does but in addition to that they think differently. They train their minds to believe that they will achieve success. They make it their unfaltering goal to reach it and their body does all the effort to fulfill that objective.

This just goes on to show one of the best applications of neuroscience in sports, which is the next frontier for technology in sports. This is only just the beginning, the possibilities of its application are endless and the gains it can achieve may be far more than what you think!

All in all, investing in your health, or any effort that you put in to be healthy, is one of the best gifts you can give to yourself. After all, we only have one life!

So, start today! It does not matter if you start going out just one day per week - it is better than what you were doing before you made that commitment. Remember, consistency is key. No matter how big or small the effort, its regularity and consistency is what makes all the difference.

Chapter 4: Importance of Sleep and Rest

Have you ever heard of insomnia?

It's an extremely common sleep disorder that makes it difficult to get enough sleep. We are living through an epidemic of sleeplessness, it's so bad that I was affected by insomnia at one point in my life, which hindered me a lot. Common causes of insomnia include psychiatric and medical conditions, unhealthy sleep habits, and the consumption of certain substances. People affected by insomnia will find it extremely hard to fall asleep or stay asleep.

In my case, it caused me to wake up too early in the morning and not being able to sleep afterward. It didn't matter how tired I was – I just couldn't force myself to get enough sleep in the day.

I didn't see this as a problem during my 20s. I used insomnia to manage my busy social life and make important connections early on. I had more time in the day to organize my daily activities.

I could freely socialize with lots of people and party all night long. I could go to raves for up to 4 days in a row without feeling exhausted or sleepy. I eventually grew accustomed to the perpetual feeling of tiredness all the time. I thought the 'mild' fatigue was a fair trade-off for not needing to sleep long hours every day and to use the extra hours to get more things done, I was so wrong. I had no idea about the subtle effect the lack of sleep had on me. It drained me of energy and took an incredible toll on my health and well-being. I was too distracted to even notice the side effects of insomnia, or perhaps I was just too young at the time to really care.

I knew in the back of my mind, however, that my insomnia was a result of ADD. The auto-medication I was taking at the time didn't help things either, and instead, it contributed to my insomnia even more than I anticipated. However, as a young guy who didn't know any better, I couldn't be happier to party all night.

The ironic thing is, I was studying science at the time and knew what insomnia could do, yet it never dawned on me that my body was getting wrecked by the lack of sleep. I could feel it sapping my energy levels, my mood, and my health but I did absolutely nothing about it. It began to have a noticeable impact on my work performance and on the overall quality of life, but I just did not care enough to do anything to change this. This was daily routine for me until my boss confronted me to the point of quitting and starting my own business. I was a lonely entrepreneur with no other choice than to do something about it… that was when I decided (and managed) to change my habits for good. Before I can discuss how to cure it, let's dig into the problems surrounding insomnia and the health consequences of having prolonged sleep disruption.

Our bodies are somewhat like a machine; they often need to warm up before functioning to their maximum capacity (that is certainly how it feels when you wake up in the morning). However, unlike machines, our bodies cannot work for long periods of time without taking sufficient breaks. The human body needs several breaks to optimize operations and critical functions. It cannot endure sleep disruption for too long and must rest to recover.

Trust me when I tell you that our body absolutely needs a decent amount of sleep to complete various functions. Sleep enables our muscles to get rest which helps in the repair and restoration of multiple tissues and cells throughout our body. Exercising leads to muscle protein synthesis and build-up of muscles, and is often, the only time when the body can initiate the recovery processes with maximum efficiency. Have you heard the saying, 'you grow outside the gym – not in the gym?' That's where sleep comes in (along with a myriad of other things).

Apart from muscle growth, there are other vital biological processes that happen during sleep. Since our muscles are at rest during sleep, our bodily functions have access to more energy reservoirs than when we're awake. Our body temperature is often at its lowest during sleep since energy is conserved and employed in producing more enzymes and mitochondria, among other processes. It is a matter of balancing and strengthening the body chemistry in which sleep plays a major role. We will discuss all the ways in which sleep is important later on in the chapter.

The sleep requirements vary from person to person and depend on various

factors such as physical activity, age, daily mental stress, etc. But it is generally agreed that healthy adults require somewhere between 7 hours to 9 hours of sleep every day to function properly. The amount of sleep you need is directly proportional to the potential growth your body can go through. This why children are recommended to sleep for longer than 9 hours while a solid 7 hours of sleep is ample for most adults. It should be noted that individual recommendations for the number of hours of sleep vary depending on the individual's health and daily activity.

Circadian Rhythm and Why Sleep is Important

For people who pursue a healthy lifestyle, getting enough sleep is just as important as taking a well-balanced healthy diet, or sticking to a workout routine. Let's put it another way: sleep helps you stay fit, and sleep requires a lot less effort. Sleeping serves as a 'reset switch' for our body after what we put it throughout the day – perhaps more importantly, it is essential for our brain. In a state of dormancy, we don't need to use our brain which gives it the opportunity to recover. Unlike other muscles in the body, our brain remains active even during sleep. While we're sound asleep, the brain handles some important functions such as organizing memory and cognition. The bottom line is, sleep is absolutely essential in the neurophysiology of learning, memory, and cognition processes.

Sleep, basically, is an anabolic state during which the body replenishes its energy reserves, regenerates tissues, and produces proteins. The main processes that occur in our body during sleep are repairing old and worn out tissue (skin, muscle, liver, etc.), but at the same time, our brain is responsible for converting short term memory to long term memory, cleaning up the day's built up metabolites and building new immune cells.

Apart from the number of hours of sleep needed, it is also important to consider the time at which you sleep. Our body has a natural daily cycle, called the circadian clock, which heavily influences our bodily functions. Our physiological functions such as sleep, or wakefulness are regulated by this intrinsic system.

The development of the circadian clock starts in the embryonic stage and continues until death. This circadian clock matures along with the growth of the human body up to adulthood and into our twilight years, however, studies have shown that its ability to influence various abilities and functions of the

human body slowly withers and weakens in old age.

This circadian clock (or circadian rhythm as it is sometimes called) is a 24 hour-cycle that is regulated by the brain in our subconscious and is responsible for monitoring and controlling our daily functions. Since it is responsible for regulating these functions, any distortion or disturbance in the cycle will also lead to disruption in the natural cycle and processes in the body. Obviously, our body starts facing problems when that cycle is distorted or interrupted. This natural cycle also determines a lot of other things such as when we feel hungry, when we wake up and when we feel tired. If you have no problem falling asleep and you already have a healthy sleep schedule, you will notice that during certain hours in the day, you feel particularly drowsy.

Maybe this occurs when you go to sleep a bit later than usual or perhaps when you are more tired than usual; you know how your own body works better than I do.

My point is, your body is used to a certain pattern…

Have you ever noticed that if you are particularly busy and focused on something during noon, you might miss your lunch meal? However, if you smell some delicious food at any time other than breakfast, lunch, or dinner you start feeling hungry and your mouth starts watering.

The same thing happens to you and your sleep cycle. When you are asleep and you are suddenly exposed to sunlight, you'll wake up and your brain and body will start their cycle for the day. This is because blue light triggers the brain into releasing hormones, especially serotonin, thus waking us up. Serotonin is important for mood, contentment, social functioning, and motivation. A growing body of evidence suggests a prominent link between bright light and serotonin levels.

Despite having partied all night long (or not having slept for other reasons), the mere sight of daylight makes us feel rejuvenated because of the sudden rush of serotonin in our brain.

At sunset, when the light starts to fade, the change in brightness serves as a trigger for our brain to reduce the level of those hormones in our blood and causes drowsiness and brings about sleepiness.

The receptors in our eyes detect darkness and send a signal to the suprachiasmatic nucleus in our brain, which triggers the release of melatonin, the hormone that causes sleepiness.

Before we know it, our eyes start feeling heavy and we start to succumb to sleep. At night when there is supposed to be no natural light in our environment, it helps to optimize our sleep quality. Without enough sleep, the human body cannot function properly.

An out of sync sleep schedule opens the floodgates to health problems caused due to sleep deprivation.

One of the greatest indicators of having unhealthy habits is being obesity. Studies have found that obesity is very common in people who don't sleep enough. Short sleep durations are one of the most common reasons for gaining unhealthy weight. According to a study conducted by Patel and Hu in 2012, people with healthier sleep patterns have a lower risk of obesity than those who have shorter sleep durations, . The primary objective of the

research was to find a connection between Short Sleep Duration and Weight Gain, and it consulted various experts in the field as well as studying previous studies published on the subject. Another study found that adults with a short sleep schedule were 55% more likely to develop obesity whereas children were 89% more likely to become obese. Although weight gain is dependent on many other factors such as exercise, diet, genetics, and hormones, among others, the overwhelming number of studies linking sleep and obesity serves as an eye-opener. As discussed earlier, insufficient sleep and irregular sleep cycles greatly disturb the hormonal mix in our and can also contribute to the problem of unhealthy weight gain.

The imbalance of hormones causes the body to have high levels of ghrelin. Ghrelin is a hormone responsible for stimulating appetite in the body. The imbalance also causes considerably low levels of leptin, an important hormone that subdues the feeling of appetite in our bodies.

In addition to its effect on a person's diet, sleep deprivation also has an impact on the performance of our brain. Since our brain reorganizes memory and its cognitive ability while we sleep, it comes as no surprise that a lack of sleep will disrupt it. Concentration, cognition, performance, and productivity are all affected by sleep deprivation as the brain feels tired without rest. A study also showed that some negative impacts of sleep deprivation on brain activity are similar to alcohol intoxication.

Sleep is extremely important for many things but what interests us most is memory and neurogenesis. The hippocampus, (the area of the brain associated with the consolidation of memory) is especially active during sleeping hours. Brain scans show that during sleep, the hippocampus stays active and stores memories. Brain activity in certain sleep stages resembles the same activity observed in the moment of learning. This may be because some studies also tell us that while sleeping, the brain transfers information from its short-term memory to its long-term memory. So, we are back to the process of neuroplasticity again!

On the other hand, sleep deprivation has been shown to raise systolic blood pressure and increase the consumption of fat-heavy and sugar-heavy foods.

In chronic cases of sleep deprivation and insomnia, it may even lead to insulin resistance at an early age. In addition to easily diagnosable illnesses

such as obesity and cholesterol, sleep deprivation is also linked with other relatively difficult to diagnose problems such as depression, stress, anxiety, and even cardiovascular diseases. Insomnia is among the leading causes of traffic accidents, and mental health problems. Sleep deprivation also lowers the body's immunity and makes it more susceptible to common diseases such as seasonal flu.

What Happens During Sleep?

Our sleep cycle consists of 3 stages of 60 to 90-minute cycles of rapid eye movement (REM) and non-rapid eye movement (NREM) sleep. These cycles are repeated throughout the night many times.

Most of our sleep is NREM sleep and is comprised of three major stages which are scientifically referred to as N1 – N3.

Stage N1: Light sleep when you are in between being awake and falling asleep. This usually lasts only a short while, in the case of a healthy person.

Stage N2: Onset of sleep. This is when you become almost completely disengaged from your surroundings, and your body temperature drops slightly.

Stage N3: Deep sleep. This is the most important stage for us because it is the stage when the brain starts neurogenesis, body tissue growth, and repair. At this stage, our energy levels and mitochondria ATP are restored. During this stage, tons of hormones are flooding in our veins, controlling functions like growth or appetite.

It is possible for a person to sleep for 8 hours and wake up feeling tired, probably because they did not reach stage N3.

It is really important for our body's sleep cycle to be in sync with the natural daylight/night cycle. Even if you complete the recommended 8 hours of sleep but are not keeping up with the natural daylight cycle, you probably won't get the full benefits of sleep recovery as the regulation of these hormones are mainly dependent on stimulus from nature.

Sometimes, due to our lifestyle, traveling, work shifts, studies, and social events, we unintentionally or intentionally put our circadian rhythm out of whack.

These disruptions to your routine can lead to a lot of problems, from basic sleep difficulties to insomnia and more rarely to a disorder known as Advanced Sleep Phase Disorder.

Here's a simple biohack to rectify this: You can reset your body clock by going back to a regular schedule and adapting to natural light in the morning.

In the event that this is a challenge for you, it is recommended to use a wake-up light that mimics sunrise. This will gradually wake you up as its brightness gradually starts increasing 15 to 30 minutes before your desired wake-up time.

This will enable an easy and smooth transition from sleep to wakefulness that will definitely avoid the unwanted stress-response caused by the sound of an alarm clock which usually triggers the release of cortisol, (a stress hormone).

Another issue caused by lack of sleep is how it will make you less active, less motivated to work out! That is because the hormones responsible for keeping you alert and active, such as cortisol, and others are mostly triggered during daylight. If you sleep during the day, you will only be getting very few hours of daylight to charge yourself. This will make you feel lazy, weak, and unable to stay motivated. It might even cause mood swings due to the hormonal imbalances caused by the out of sync sleep schedule. Despite sleeping for more than 8 hours, you may not feel fully rested.

With all this evidence, it is fairly clear and simple to understand how the circadian rhythm affects the body and regulates it in terms of mood, behavior, thinking, hormones, body temperature, and even our eating habits. As soon as the natural circadian rhythm goes out of sync, we become vulnerable to a number of concerning health problems.

In our never-ending struggle to improve our quality of life, we make compromises on crucial things. Compromising on getting proper and adequate sleep is often a bridge too far.

6 Sleep Hacks to Cure Insomnia

Falling asleep may seem like a far-fetched dream when there are so many distractions keeping us awake. From endlessly checking our social media feeds to going over past emails and everything in between – the struggle is real. Some people spend more time trying to fall asleep rather than getting

actual sleep. And they are not alone. Over 70 million adults in the US suffer from some type of sleep disorder.

The mere act of trying to fall asleep can induce anxiety that, in turn, leads to the body's fight or flight response being activated. It's a vicious cycle that sounds like an oxymoron, but it's very real.

It goes without saying, that if your body doesn't get enough sleep, essential body processes will start falling apart. Sleep is the one time during the day when the body can begin the healing process and cleanse itself of toxic molecules.

Before we get into the ideal sleep hacks to implement, it's worth discussing a few small lifestyle changes you can start implementing now.

Avoid Caffeine, because it prevents adenosine from binding to receptors in your brain turning off or delaying the natural 'sleep signal'

Avoid napping or keep your naps relatively short. Science has shown that 27 minutes is the optimal time for a midday nap.

Warm Shower before Sleep, as it helps you unwind and lower your core temperature. A low body temperature is a circadian signal and a powerful cue that it's time to fall asleep. The science behind it is simple: When you take a warm shower before bed, your body pumps up blood to your skin, then the ambient air cools it down and sends it back to your core to stimulate a strong sleep response.

Take Magnesium, it is essential for numerous cellular processes and for recovery sleep. It may seem tempting to take melatonin supplements, it's better to avoid going down the pharmacology route because the body should make the hormone naturally. Furthermore, taking melatonin supplements could be addictive and lead to dependency.

To help you get one step closer to falling asleep, I have rounded up some effective sleep hacks no one told you.

Listen to music

The music will not get rid of insomnia, but it can give you some brief respite. There is evidence that listening to relaxing tunes (such as classic music) may improve your quality of sleep. According to researchers at the British

Academy of Sound Therapy, listening to specific keys, notes, and sounds helped people fall asleep faster. Check out the links for full details.

Wake up at the Same Time Every Day

Our body clock is roughly based on the earth's daylight cycle. Daylight causes us to stay awake and night causes our bodies to release melatonin, indicating that now is the time to sleep.

Yet most of have a tendency to sleep during the day and stay up during the night. This completely rattles our internal clock, making it harder to fall get high-quality sleep.

The Importance of Consistency

Maintaining a daily routine is critical to our well-being and affects our sleep cycle. One of the most effective ways to get to sleep is to set an alarm and then go to bed. Make sure you stick to the schedule through thick and thin – no matter how tempting it may be to stay past your self-imposed 'curfew'.

Respect the alarm clock when it starts buzzing. Do not reach for the snooze button because any sleep you get now will be of no help. It will disrupt your REM sleep, which just makes you groggy when you wake up. If you really need that extra 5 minutes of sleep, adjust the alarm clock to ring 5 minutes later, that would be a better solution.

Keep a Sleep Log

In general, it is a great idea to keep a log of everything you do every day, from what you eat, to how you train, and even how you sleep. This gives you access to valuable information about any negative habits that could be hurting your attempts at sleeping.

To start a log, you can create a spreadsheet or buy a sleep diary. There are a few variables that you should track, including:

- The time you got into bed
- The time it took to fall asleep
- Whether you got up on time or if you woke up in the middle of the night

- The number of times you hit the snooze button in the morning
- How long your nap lasted
- The time you woke up
- What you ate
- If you exercised that day
- A rating of your sleep quality for that night (on a scale of 10 or 5)

The idea is to track these variables over a period of time to notice your sleep patterns and how they respond to the food you eat, the kinds of exercise you perform, and other habits.

Sleep in a Dark and Cool Room

Our body's internal clock is extremely on-point when it comes to responding to outside stimuli. In some cases, even a tiny bit of light into your bedroom can disrupt your sleep pattern and reduce your quality of sleep. This is true for just about any type of light, including LEDs from computers, alarm clocks, as well as the glow from smartphones.

Try to turn these light sources off when it is time to sleep. If that is not possible, try using a sleeping mask to block out all the artificial light. It is best to sleep on your back or side for opening your chest cavity. Sleeping on the left side can help with digestion. Sleeping on your belly, however, is not recommended because it puts strain on your spinal cord.

Eat Breakfast Every Day

Most sleep specialists suggest that you should not eat too close to your bedtime and eat the right kind of food during breakfast. More importantly, breakfast plays a role in regulating our hormones, including cortisol – an infamous stress hormone. If our body produces too much cortisol, it could be enough to disrupt our sleep patterns.

So, there you have it, 6 sleep hacks that no one told you! Sometimes, all it takes is a few tweaks in our everyday lifestyle habits to improve our quality of sleep.

In conclusion, the steps outlined above can optimize your delta waves associated with deep sleep.

Delta waves are the slowest brain waves in humans; they are associated with relaxation, regeneration, and healing.

This strategy is obvious but remains one of the most overlooked biohacks. As I explained, sleep deprivation is one of the main reasons why the body shuts down and becomes prone to infectious diseases. It really does a number on your immune system. Sleeping for a certain minimum number of hours in the day (usually 8 hours) is the sure-fire way of extending your lifespan and preventing just about every kind of disease out there. When you enter a state of a deep sleep, otherwise known as ‘slow-wave sleep’, your body clears out metabolic by-products that it accrued during the day.

More importantly, sleep does not cost anything and requires next to no effort – unless of course, if you are nostalgic, but that is a story for another day.

If you are having trouble with getting enough sleep, then try to identify the reasons for sleep deprivation. It could be something as simple as your phone on the bed, chugging too much caffeine in the day, or using too much prescription medicine. When you maintain a regular sleep schedule, your body primes itself for whatever you throw at it the next day – especially intense workout routines.

Sleep essentially serves as a ‘reboot’ button for the body. Sleep lets the body process all the hard work we did during the day. For instance, whatever workout you did, or whatever you learnt during the day, your body will respond better to it when it is fully rested. Thus, in some ways, getting ample rest is even more important than rigorous exercise if you want to stay healthy.

Chapter 5: Diet Control and Intermittent Fasting as a Biohack

Humans depend on air, water, and food to survive because they provide us with the required energy to perform our day to day activities.

"We are what we eat"

This is something that we have heard or read quite often but fail to understand in its true sense. Food and diet are one of the few things that we have full control over. We can choose a healthy diet or something that is composed of junk food. The food we eat goes into our stomach where it is broken down into smaller pieces, converted into energy, and absorbed in the body.

What we eat gets absorbed in the body, so technically, we really are what we eat. That goes on to show the importance our diet holds as it influences our body's composition and ultimately, our health.

It is true to say that a large percentage of the effort in staying fit should be dedicated to your diet as it affects your body. Exercising without enough sleep is not going to work. Imagine this, if you perform regular exercise but load your body with lots of junk foods and fats, do you think you will stay healthy? No. While it is true that humans are omnivorous thus, they can survive and live by eating almost anything edible. But just because it's edible does not mean it's good. Eating healthy means eating as many calories as you burn every day and having a balanced diet.

A Healthy Diet Guideline

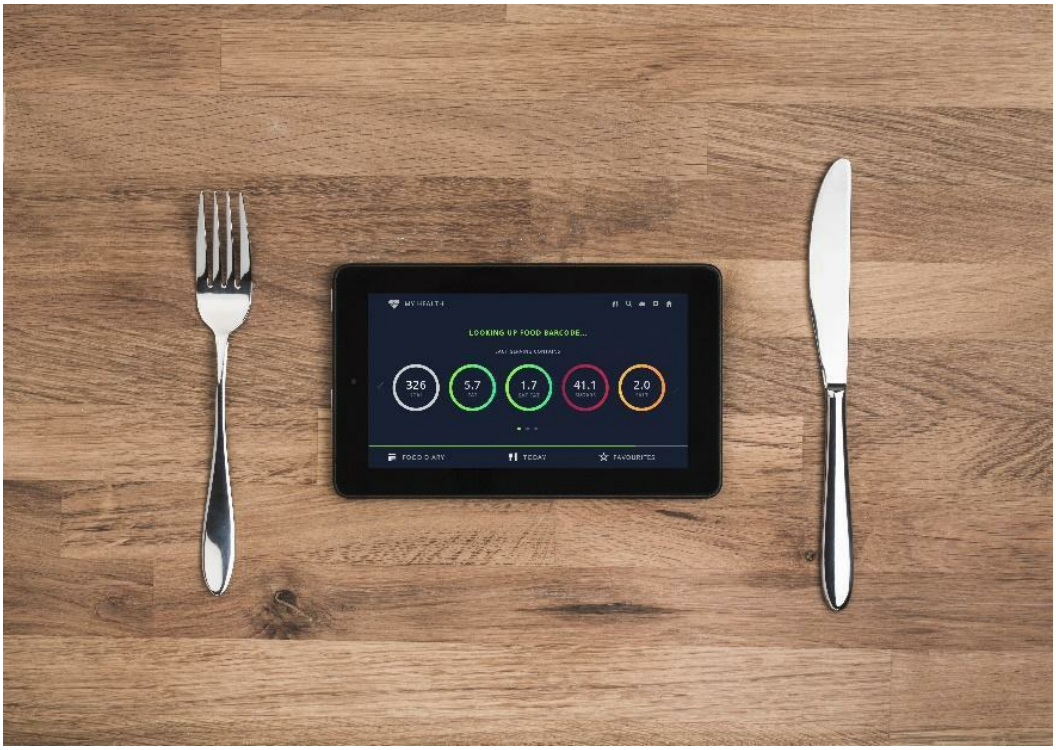
There is no such thing as a one-size-fits-all diet plan that everyone will agree on. But there are certain primary rules that are widely agreed upon.

Monitor your calories

Most of us already have some idea of what calories are, but let me explain it again for those who are new to this. Calories are units of energy that are used

to measure the amount of energy that is stored in your food. This energy goes into our body when we eat food and the energy which is left unused is stored in our body in the form of fat!

However, it is a very basic and inaccurate metric. By the scientific definition, a calorie is actually the amount of energy required to increase the temperature of 1 gram of water by 1 degree Celsius. We are 70% water! And moreover, it is a measure of the amount of heat produced from the food you eat… now I know there is a fire in you, but that's not what the calorie means here, right?



The fact is calorie intake is more related to the nature of the food you eat. Foods, (like people), have different traits and nutrients that interact with our bodies in different ways.

Even with the same caloric ratio, the metabolic pathways that they are going to take in your body will require or produce different amounts of energy.

Also, if you want to stick to basic science, calories do not take into account our hormones. 1 calorie of fat vs. 1 calorie of carbohydrates have a completely different impact on insulin, the messenger hormone for stocking fat in your body.

While the prescribed daily calorie intake differs from one person to another,

it is generally assumed that women normally need around 2000 calories to maintain their weight whereas men need 2500 calories daily to maintain their weight. Again, this is only an average estimate and differs from person to person and on their specific needs.

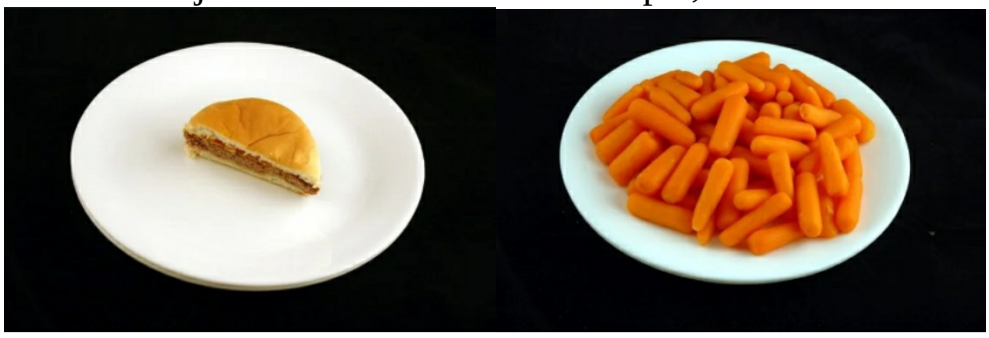
Your daily calorie intake depends on your body's metabolism, your workout routine, whether you need to shed weight or bulk up, height, and more. A simplified way of regulating your calories is to see how much of it you burn every day and how much you consume daily. If you consume more calories than you burn, the extra calories are stored for future use. A common solution is to either cut down on your carbs or increase your exercise to burn more calories, or do both.

However, if cutting down on carbs was that easy, we wouldn't be writing publications and debating over diets. The calories you adjust via diet are nearly impossible to measure in precise terms.

But since we have not found any metrics, for now, most diet metrics are based on calorie monitoring.

They can easily be measured by keeping track of what you eating. Most food items in groceries come with labels that indicate how many calories they have. By monitoring your intake of calories and your daily physical activity, you can easily regulate your own health.

Balanced diet

There is more to food than just calorie count. For example, look at the pictures below 

On the left is less than half a portion of a chicken cheese sandwich which will barely even count towards one meal, whereas on the right is a plate stacked with carrots that you may not be able to finish in one sitting.

Both portions amount to the same calories which are 200. The difference between the two is their composition and how healthy they are. The carrots are mainly composed of water and carbohydrates and have less than 1% of unhealthy fat. By contrast, the chicken cheese sandwich consists of a large portion of trans fat and other processed food ingredients that are hard to naturally digest.

There are 7 main components that make up a healthy and balanced diet: carbohydrates, proteins, fats, vitamins, fiber, minerals, and water. The intake of these constituents in a balanced and regulated quantity defines a balanced diet.

To have a well-balanced diet, it is essential to have a well-rounded intake of all these constituents as they are important for the body in one way or the other. Carbohydrates, in their simplest forms, are made up of sugars and serve as the primary source of energy in any kind of food. Proteins are responsible for the repairing and growth of cells and tissue in the human body. Fats provide us with more concentrated forms of energy when burned when compared to carbohydrates. Vitamins do not provide energy to the body but play an important role in the absorption of carbohydrates, proteins, and fats, thus they ensure normal growth and health. There are various types of vitamins, namely, A, B, C, D, E, and K which can be taken by eating a variety of different foods.

Minerals as indicated in their name are trace amounts of other elements in our body such as iron, calcium, iodine, phosphorus, copper, etc. They serve various functions in the body, for instance, iron is required to form hemoglobin in the blood, and calcium forms most of our bones in the body. Fiber helps with the movement of the food we eat in our digestive tracts such as the stomach and the intestine. It ensures that the digestive system keeps functioning properly. Water constitutes around 70% of our body’s composition and is essential for the transport of food as well as regulating the body’s temperature, among other things.

My opinion is that diets suck! Take the example of the ketogenic diet. While it is lauded for help with weight loss, it can contribute to higher LDL and triglyceride levels in some individuals.

Moreover, the efficiency of dieting is affected by several parameters

including genetics, microbiome, physical activity, your age, your gender, and your environment.

So why take any risk?

Simply eat natural!

In today's hyper-fast and hyper-connected world, we've become too complacent when it comes to food. Instead of eating healthy, our main priority is to eat whatever is most convenient to make and will take the least amount to prepare. For some people, eating fast food is a more convenient alternative than making healthy males at home, despite the well-known health hazards.

This also applies to processed and packaged foods, since they contain many preservatives for longer shelf life - so that you can eat them wherever and whenever. All you have to do is open them, and with little to no preparation, your meal is ready for you to eat. But in the process of conserving shelf life, packaged foods lost nearly all their nutrients and may be dangerously unhealthy.

Food preservation comes at the expense of health, but it's a thriving industry because people prefer convenience over safety. We should try to eat more natural foods because they are loaded in healthy nutrients and vitamins and are easier to digest. In the case of processed foods such as cereal and cookies, their ingredients are stripped of these healthy nutrients. Processed foods are also full of sugars and fats compared to natural foods. Let's consider an example of a bar of snickers and lettuce. Which food item is healthier? Not only do vegetables and fruits have lesser sugars and are rich in nutrients, but they are also rich in "good cholesterol".

High-density lipoprotein (HDL) and low-density lipoprotein (LDL) are referred to as "good cholesterol" and "bad cholesterol" respectively. HDL is referred to as good cholesterol as it transports cholesterol to the liver from where it is expelled and is less likely to deposit in the arteries. LDL is referred to as bad cholesterol because instead of being transported to the liver, it is deposited in the arteries where it keeps accumulating. This may lead to blockage of different blood passages leading to the heart and may cause debilitating cardiovascular problems.

Junk food and baked goods mostly consist of fried foods with high amounts of trans fats or saturated fats. This is also true of various dairy products and processed foods which increase LDL cholesterol in the human body and are unhealthy. In contrast to this, naturally available fruits and vegetables consist of HDL that help regulate the cholesterol levels in our body. Vegetable oils, olive oils, and whitefish are recommended in a healthy natural diet as they serve as a great way of reducing overall cholesterol levels and the consumption of whole grains.

Consumption of processed and packaged foods is linked to overeating and food addiction. How many times have you craved for a slice of cucumber or avocado in the middle of the night? Hardly ever, I think. And how many times have you craved a hamburger, some fries, or even a cheesecake? You might have your answer right there.

For vulnerable people, eating junk food could lead to full-blown addiction. Scientists still can't figure out if junk food addiction is due to ease of access or enhanced flavors, no one is sure. But there is no denying that people who eat excessive junk foods may end up with an addiction.

Avoid sugars

Consuming foods that are rich in sugars become fairly for us. We readily consume milkshakes and sodas every day, unaware of their ingredient profile or the number of synthetic sugars present in them. We give no second thought to their impact on our bodies and have slowly integrated them into our lifestyle. Having creamy donuts, or an ice cream milkshake, or a sundae as a super-high-fat meal has become a norm for us.

Sugars are primarily responsible for providing energy to our body. They are also responsible for influencing our blood glucose levels, but they are not without their risks. For instance, an excess of sugar intake has various negative effects on one's health.

Foods rich in sugar are loaded with calories that aren't needed by our body right away and get stored in the form of fat beneath the skin. This accumulation of fat, with time, causes obesity which makes us fat and unhealthy. In addition to it causing obesity, it also has a great likelihood of causing diabetes. This, again, is much more common in people who consume processed foods but still, avoiding sugars altogether is a good option and will

lead to a healthier mindset and body. If you do not believe me, you are welcome to try and lay off the sugars for a few months and notice the dramatic changes in your body. You can get your body's prescribed sugar intake from natural sources such as from fruits and vegetables without the risk of addiction or danger.

Despite the known concept of sugar addiction, it is still a source of much contention among scientists, but it's also true that sugar influences the brain's reward process just like addictive drugs.

At the time of writing this book, these results have just been published in the Journal of Scientific Reports.

Remember, excessive consumption of sugar will reduce your memory capability, increase your risk of obesity as well as diabetes. A major portion of neuroscience research funding is directed to the intricate role of sugar and its effects on our brain and body.

Remember neuroplasticity? So, the principle of addiction makes sense when you apply the theory that our brain continuously rewires itself. The same process happens in the reward system, therefore repeated activation by sugar intake causes the brain to adapt to frequent stimulation, which of course, leads to addiction.

These are some of the main guidelines for controlling your diet effectively to achieve a healthier lifestyle and to reach your desired health goal. It won't be easy to implement a healthy meal plan regiment and many people will fail to abstain from trans fats and sugar for too long. It might even be a hassle and too much effort for people to start measuring calories in their food and to start getting to know the constituents of their food to devise a healthy eating regiment. Therefore, I am going to share with you a biohack on how to start eating healthy.

While there is no substitute for an actual healthy eating regiment customized to your own body's needs, a little help from a biohack wouldn't hurt.

Intermittent Fasting

There are a lot of myths and confusions surrounding the concept of intermittent fasting as a result of which not many people are ready to accept it at first. But I am going to explain its concept in a simple way.

Simply put, intermittent fasting is a diet pattern that consists of rotating periods of eating and voluntary fasting. It does not strictly dictate what you should eat; rather it dictates when you are supposed to eat and when you are not. Basically, you split the day or week into periods of eating and fasting. This should allow you to create a calorie deficit and lose fat in the process.

How does it work?

Pretty basic! There are 2 states to remember in the principle of intermittent fasting, one is called FED and the other is called FASTED. When you are eating and digesting, you're in the FED state that lasts from 3 to 5 hours, your insulin levels climb and it's barely impossible to burn fat. After this process, you enter the FASTED state, also called the post-absorptive state, which lasts from 8 to 12 hours after your last meal. Your insulin levels decrease, allowing you to burn fat. It takes around 12 hours to enter the fasted state after our last meal, at which stage we can burn inaccessible fat. Fasting puts your body in a perpetual fat-burning state that is otherwise not possible in a normal eating schedule.

Although there are various methods and ways of implementing intermittent fasting, below are some of the more popular ones.

16/8 method: In this method, the eating and fasting periods are monitored in

a day and are broken down into 16 hours of fasting with 8 hours of eating in the day.

Eat-Stop-Eat method: This method involves fasting that lasts one or two non-consecutive periods of 24 hours. For the rest of the two days, they can eat anything as long as they don't go overboard.

5:2 method: This also deals with a week but instead of not eating anything for a complete day or two days in a week, you only eat 500 calories during two non-consecutive days.

All these methods only work if you don't overeat. Our main objective is to strip down the overall calorie intake of the body, which is not possible if you overeat. There are other popular methods of intermittent fasting as well, but it is essential to understand its effects on the body.

The bottom line is simple: intermittent fasting is good for your brain and improves various metabolic metrics that improve the body's overall health. Benefits include low blood sugar levels, insulin resistance, lower inflammation, and lower oxidative stress.

Best part? Your body starts healing itself and adjusts its hormone levels to make the stored body fat more accessible and facilitates its use for energy.

Short term fasting also increases the body's metabolic rate by up to 14%, helping you burn a lot more calories than you usually would.

People on an intermittent fasting diet can easily lose at least 7% of their waist circumference, which is an indication of a lot of belly fat, the harmful bit in the abdominal cavity that can cause a bunch of diseases.

Furthermore, intermittent fasting has impressive benefits for insulin resistance and blood sugar levels. Studies have shown that fasting can reduce blood sugar by as much as 6%. This indicates that intermittent fasting is helpful for anyone who is at risk of developing Type II Diabetes. It should be noted that intermittent fasting is safe for many people, but just like dieting, it may not be recommended for everyone!

Intermittent diet is not for you if you are pregnant or have medical problems. Make sure to ask your doctor if starting intermittent fasting is good for you.

Neuroscientific studies have shown that intermittent fasting is linked with

improved cognitive and brain functions in the hippocampus… good for unlocking calisthenics skills, no?

I fell into this after checking up on research that suggested intermittent fasting is beneficial for individuals with ADD. However, I faced a few side effects with intermittent fasting such as hunger, fatigue, insomnia, thus aggravating the symptoms of ADD and making me less functional.

Going straight back to my previous point: **Diets suck!**

Chapter 6: Regular Monitoring

You might have understood by now that there is no such thing as a fully tested and universally accepted guide to becoming healthy. Even if a diet plan or exercise routine is effective on you, it may not stay that way forever.

This is because our bodies are constantly changing and each individual is unique from one another. A type of diet or supplement working on one person may not be as effective on the other because they have different bodies and live extremely different lifestyles.

Many factors influence our behavior. Our mood depends on our surroundings and the people we interact with, our body's functions are dependent on the type of lifestyle that we adopt, and our metabolism is affected by the physical activity and the food we eat.

The unique mix of all these factors influences how our body reacts to different diets, foods, and supplements. Even if two siblings have the same type of lifestyle and eat similarly, the way their body behaves might still be different because of the subtle nuances in their genetics and DNA.

Similarly, sticking to one diet for too long isn't nearly as effective, as our body continues to grow and change with time. Limiting your calorie intake might help you shed some extra weight in the beginning, but it won't be long until your body adapts to the new norm and readjusts its programming to store fat as a backup.

Just because you're thin doesn't mean you're healthy. What you need is a healthy mindset to adopt a lifestyle that maximizes your body's potential.

Making changes to your diet, physical activity, and behavior without knowing and understanding their effects, is like shooting an arrow in the dark. If it hits the target, it is based solely on luck, but there is no telling if it will hit it a second time.

You have to learn how to bet on sure things instead of shooting arrows in the dark and hope it lands!

Read Sun-Tzu's The Art of War and you'll learn that every battle is won before it is ever fought.

Winning takes a certain kind of lifestyle and mentality, and learning how to weigh the pros and cons of every decision you make.

To grasp a full understanding of how something affects you, it's important to start monitoring yourself. Your body is unique in and of itself, requiring a journey of self-discovery to find out what works best for you! Try not to copy someone else's approaches to health.

We are responsible for what happens to our body and to our mind, therefore, it is time to stop playing the role of a victim, and start taking responsibility for your own life and health! I'm going to tell you a few harsh truths here, because you have to hear them.

You do not become obese because of society, family, or culture, it's a conscious decision you make every time you decide to eat junk food. Your cholesterol levels don't just spike randomly nor do they happen overnight, your cardiovascular endurance and fitness levels won't improve without a change in lifestyle, you will NOT perform a planche by sitting on your couch eating potato chips all day...

Listening to your body gives you the power to change what you do not like:

No one will do it for you,

No making excuses,

No blaming others,

JUST ACT and BE RESPONSIBLE!

Why is monitoring your body necessary?

Nowadays, due to the type of artificial foods we eat, it has become more important than ever before to stay sharp and updated on our body's status. In many cases of diabetes, cholesterol, and obesity, we don't notice abnormalities until the enormity of the damage done becomes evident. It is not as if you fall asleep and wake up to find out that your body's blood sugar levels have climbed too high. These things take their time, gradually building up to the point of catastrophic consequences.

It is often after years of eating unhealthy foods, that our body develops

cardiovascular problems, hypertension, diabetes, mental stress, and more. Usually, our immune system is resilient to diseases and illnesses but weakens after prolonged exposure to a sedentary lifestyle, unhealthy foods, and lack of care.

Slowly, our blood pressure starts to deviate from normal readings and the cholesterol content in our blood rises. The point is, all of these health issues take time to become noticeable. Sadly, once the damage has been done, it is usually too late to make a recovery without resorting to drastic measures.

It would be prudent to actively monitor your body's health-related indicators on a regular basis, so that these problems are diagnosed as early as possible. For instance, an increase in blood sugar levels, if caught early, lets you regulate your sugar intake and your regain health before it gets to the point where you are prescribed insulin shots.

Similarly, if you have a habit of eating unhealthy foods, it will take a few years for the bad cholesterol to accumulate in your arteries and veins to cause blockages. You could go down the pharmacological route to counter cholesterol buildup, but these medications have their own side effects in the long term. However, by regularly monitoring your health, you will easily notice the negative indicators of health. This allows you to take precautions from an early stage to avert danger.

This approach applies to all other methods of healthy applications such as diet, exercise, and sleep. Whatever you are eating, it is a good idea to count your calories, both in and out. For example, if losing weight is the goal, consider reducing your caloric intake by around 300 calories less than what your body consumes, and do the opposite if you wish to bulk up. This does not necessarily mean eating less to lose weight, rather eat foods that have a low-calorie density, and vice versa for gaining weight. Quantify the portions of carbohydrates, proteins, fats, and other nutrients and keep an eye out for the effects on your body. What you eat is broken down and becomes a part of you, and your body will respond to it; either in a positive way, or in a negative way, manifesting itself as either an increase in energy, better mood, higher focus, or feelings of stress, insomnia, and tiredness.

Something people often do not anticipate when they start exercising is that they're not going to be a powerhouse at the gym at the beginning. You

shouldn’t expect that a few days of regular workout at the gym, without any prior experience, will miraculously give you the power to do heavy deadlifts and planches. It’s just not realistic. Regardless of their state, people often overestimate their physical ability and end up receiving injuries when they push themselves too far. They see other people catching up much quicker than them and feel envious of their progress. The most important concept to understand is that no two people are ever alike. Each of us has a different bodily structure, which means we are running on separate biological clocks. Just because someone you know was able to perfect an exercise in two or three months, does not necessarily mean that you will be able to do so as well. You may learn the same movement in less than two months, or it may even take you two years to do so. It’s perfectly normal.

How to do it?

The important thing to do is to keep monitoring yourself so that you know your own limits and explore what works best for you. Monitor the effects that different types of foods and diet plans have on you then narrow it down to a strict regimen that gives you the best results. This also applies to the types of exercises that suit you best and then finding your fitness groove.

Fresh produce

As discussed previously, natural, and fresh foods have no substitute. Anything that you eat to replace fresh foods will only harm your body in one way or the other. A balanced amount of proteins, minerals, carbs, fats, vitamins, nutrients, and fiber intake in the body is only ensured when you eat a whole range of fruits and vegetables. While it is not possible to eat all kinds of vegetables and fruits every day, it is definitely attainable to construct a diet plan for a healthy living. This once again requires you to monitor your daily food intake and ensure that you get enough dietary fiber to help in its digestion.

Exercise

It is not mandatory for you to perform rigorous exercises or to perform a very complicated set of movements to stay fit. What all these exercises aim to achieve is to make sure that you stay fit and active throughout the day. Running, swimming, cycling, gymnastics, or even walking counts as physical activity. It is essential to analyze your daily activity to ensure that you burn

enough calories.

Relaxation

The human body is NOT a machine, it necessitates rest to perform many functions and to prepare for the next day. The importance of sleep has already been established earlier in this book: various regenerative and growth functions of the body take place when we sleep. A lack of sleep unleashes a slew of health problems for your body. Regardless of how healthy you eat or how much you exercise; you won't reap their true benefits unless you give your body its proper rest. Apart from sleep, some laughter and fun throughout the day is also necessary for the mind and body to maximize your true potential.

You can easily check your health by monitoring your daily sleep. We have normalized the use of alarms to wake up, but we don't need them when we have the circadian clock. When your body is fully rested, it wakes up on its own. We use alarm clocks only because we do not wake at the designated time naturally – and that is a symptom of an unhealthy problem.

The same goes for drowsiness in the morning. Research shows that people who feel excessive drowsiness exhibit traits of unhealthy sleep patterns. People who nap right after dinner often suffer from sleep disorders. They should reorganize their daily schedules to accommodate about 8 hours of sleep. If you still continue to feel lethargic after 8 hours of sleep, that means your body is low on energy.

Hair-loss

Iron deficiency is closely tied to problems of hair loss and weaker hair shafts, resulting in split ends. Moreover, this is a strong indicator of low mineral levels in the body. Iron deficiency is easy to monitor; check your hairbrush for hair loss whenever you comb to see how much falls out. This will enable you to act quickly and readjust your diet to eat more iron-rich foods and prevent any further hair loss. Hair loss is also caused by thyroid disease, so it is smart to get a checkup when you notice such symptoms.

Measurements

Although obesity is obviously a visible symptom of an eating disorder, it usually only manifests after you gain several extra couple pounds of fat.

Shedding off each extra pound of weight can be tough and you'll often wish you had found out sooner. After all, losing 2 to 3 pounds is much easier than losing an extra 10 to 20 pounds, which is why it is important to know your measurements. If you regularly monitor your weight, height, and waist, you'll notice when you gain a few extra pounds. This will allow you to take immediate steps as soon you notice anything different and you'll make healthy changes before it gets too late.

Another thing to do is to keep measuring your height regularly after you turn 50 years old. This helps to diagnose any posture or skeletal alignment and health problems that might occur at an older age. Although more visible in later years, skeletal health starts deteriorating from early on and can be improved if diagnosed and addressed in your younger years. Changes in height and stature indicate changes in bone density in a body that shows poor bone health. If the changes are drastic, it is better to consult a physician to have a bone density test as it detects losses in bone health even before your height starts to change.

Check your urine

Whatever goes in the body, also comes out at some point, either in the form of useful work done or in the form of waste material. Leftover nutrients that the body does not need, and things that cannot be absorbed, are excreted out of the body. Whatever the body throws out can be a great indication of its health. It may sound gross, but monitoring your urine is a good way of knowing how healthy your body is.

Normally your urine must be very clear with only a hint of yellow. Anything other than that means there is something unhealthy about the state of your body. If your urine is of a darker shade or has a strong smell, that means you are not getting enough fluids in your body. Various imbalances in our digestive systems are caused when we do not drink enough liquids. Drinking more water allows more waste to be excreted from your body and your urine will appear normal. However, if your urine stays dark-colored even after you increase your fluid intake, then it is better to consult a doctor.

Heartbeat after exercise

Most of us have become very complacent in our daily routines, so much so that we are unable (or unwilling) to take out time to workout. Physical activity, irrespective of its intensity, must be done regularly to keep the body and heart active and healthy. As a result, when we perform physical activity after a long period of dormancy, we feel that our body is barely keeping up. This is because it is not used to the physical exercise.

A sedentary lifestyle can cause various cardiovascular problems in the future. To avoid that from happening, it is important to keep checking your heart rate. A study found that women who have a poor heart recovery reserve (HRR) after exercise had twice the risk of suffering from a heart attack, as opposed to those who have a normal heart recovery rate.

HRR is basically the difference between your maximum heart rate and your resting heart rate. To first achieve the maximum heartbeat, it is important to do strenuous physical activity which will send your heartbeat racing. After your heartbeat has sped up, you can measure your pulse by counting your heartbeat for 15 seconds and then multiplying it by 4. This will tell you how many times your heart beats per minute. After that, sit down and rest for a couple of minutes so that your heart rate returns to normal. Once it does, measure it again for 15 seconds and multiply by 4. Subtract the numbers and note the resultant number.

Mayo Clinic defines HRR as the difference between your resting heart rate and your maximum heart rate.

Often used when calculating exercise target heart rates, the formula is: HRR = HR (max) - HR (rest)

In the fitness industry, most exercise programs have been created using HRR.

The Mayo Clinic recommends gauging the Maximum Heart Rate (HR Max) by calculating maximum heart rate by subtracting your age from 220.

Another important parameter is to know the desired Heart Rate Zone, where your heart is being exercised but not over-boosted, it is a simple formula, known as the Karvonen formula. Here's how it works:

1. Calculate your HRR
2. HRR x minimum and maximum percentage
3. HRR x 0.6+ HR
4. HRR x 0.9+ HR

> The range of these two numbers (HRR x 0.6 and HRR x 0.9) is your target heart rate zone.

Light physical activity: 40 percent of HRR

Moderate physical activity: 60 percent of HRR

Intense physical activity: 90 percent of HRR

This is based on the article published in January 2017 in the British Columbia Medical Journal.

Diabetic indicators

Another common disease that affects millions of people is diabetes. According to a report, more than 100 million American adults are living with diabetes or prediabetes, which is a staggering statistic. If allowed to progress to an advanced stage, patients are left dependent on insulin shots for the remainder of their lives. These insulin shots are not a cure, as they only suppress the symptoms of diabetes, and needless to say, they have a ton of side effects that can damage the body.

Through diet changes and weight loss, it is still possible to reverse the effects

of diabetes and maintain normal blood sugar levels without the use of medications. But, to do so it is important that it is diagnosed at an early stage so that it can be countered before it becomes worse. One of the symptoms of having diabetes is foot problems. People with diabetes mostly face nerve damage in the extremities of their body because of which they are susceptible to foot damage. Having cuts, bruises, peeling skin, fungus or even blisters on their feet can be a pretty strong indication of diabetes. Looking out for these symptoms early on could play a role in minimizing the effects of diabetes.

Blood pressure

Lastly, monitoring your blood pressure is vital. We live very busy lives, hustling and trying to be as productive as we can be in the limited time we get in a day. This is one of the reasons multitasking has become common in our life as we try to fit more and more in our tight schedules. The peer and societal pressure give us multitudes of stress which leads to depression, anxiety, and various other mental illnesses in people, but that is not all. It also increases the chances of having hypertension which can lead to cardiovascular complications in the future.

Nowadays, blood pressure monitors are widely available without the need for prescription, and it is the easiest step toward improving your condition. As Gordon Gekko states in my favorite Oliver Stone movie from 1987, *Wall Street*: it takes one minute, cost-effective as a visit to a doctor…

Needless to say, high blood pressure causes a lot of problems as it increases the chances of having a stroke and may even lead to a heart attack. One of the worst aspects of hypertension (high blood pressure) is that it does not have any symptoms. You can have high blood pressure for a long time (years even) and may still go undiagnosed as it does not show any symptoms. Therefore, it is important to check your blood pressure every 4 to 6 months, either by yourself or from a doctor. Here’s a simple rule: if the bottom number exceeds 90, and the top number exceeds 140, this signifies high blood pressure. In this case, check your blood pressure again after waiting a day and if it remains high, then it is better to consult a physician.

Apart from all the advice above, just listen to your body. Making changes in your lifestyle is necessary but knowing how they affect your body is also important. By continuing to monitor yourself, you will be able to customize a plan, consisting of proper diet and exercise, which will work best for you. As

a result of this, you will start understanding your body much better and will be able to keep changing and improving your health indicators.

Chapter 7: How Music Conditions the Brain

Music plays a subtle yet meaningful role in our daily lives. It is the art of transforming sound waves, a series of compressions and rarefactions purposefully traveling through a medium. We live a life practically surrounded by music, from our cell phone ringtones to the elevator chimes in our offices to everything in between; it's everywhere.

Music has the capacity to influence our mood and energizes us, this explains why it is sometimes banned in sports to prevent athletes from gaining an unfair advantage. Have you ever felt down and out, but a song on the radio instantly energized you and got you moving? Or, perhaps an oldie made you remember something from the past and you got just a little sentimental?

It is amazing, isn't it? Our brain's interaction with music depends on the kinds of instruments played, but there's no denying the powerful influence it has on us. A growing body of research proves us with substantial proof that music influences our mental and psychological state.

Dictionary.com defines music as the following:

> *"Music is an art of sound in time that expresses ideas and emotions in significant forms through the elements of rhythm, melody, harmony, and color."*

Most of you reading this book probably won't be familiar with this definition, yet we do not need to memorize its meaning verbatim to identify when a song is playing. An infant does not know the definition of music, yet they can identify differences in musical tones, just like adults.

Benefits of Music

The scientific aspects of music and its role on our brain is still uncharted territory. While we're not entirely familiar with the "why", we do know the "what" of music's effect on the brain. Many experts argue that music keeps the brain engaged by providing it with a 'total brain workout', much like

working out at the gym exercises the body.

Many scientific experiments have concluded that listening to music boosts creativity and focus. You would be hard-pressed to find any athletes or performers who don't listen to music before their performances. Various boxers and fighters are also known to listen to music before big fights to calm their nerves and stir their ambitions. Listening to and creating music enhances the creativity of an individual. Have you ever done a workout routine while listening to upbeat music and noticed an extra spur of energy? Have you ever listened to classical music while creating something only to be overcome by a wave of new ideas?

Although the full benefits of listening to music are unknown, there are some benefits that are backed by, and proven by various studies.

Improves Exercise

This is a well-known fact and is utilized by many fitness centers nowadays. You'll find most gyms playing upbeat music, and there is a reason for that. Music stimulates not only the brain but also the body. Some kinds of music just get you moving and that is the type that stimulates physical movement. You might hear a catchy song and suddenly notice yourself drumming your fingers in sync with the beat. This is the same stimulation that makes you squeeze out a few extra reps, improving your overall performance.

Elevates Mood

Agreeably, not all types of music cater to a person's individual interest but there are some genres, specific songs, and melodies that can get you off the couch and flexing in front of a mirror! When our ears register music, it triggers some very specific actions; one of these includes the release of certain chemicals in the body. If we enjoy the music, our brain responds by releasing **dopamine** into the bloodstream. Dopamine is known to have positive effects on our mood; thus, music can literally influence and elevate your mood. Sometimes it can even make you feel an entire range of emotions, including joy and happiness.

Decreases Anxiety

The relationship between the release of 'happy' chemicals in the body and the kind of music playing on the beatbox can be used to decrease anxiety. Since

music also improves focus, it helps people struggling with anxiety to not focus on negative thoughts and only to concentrate on the sound that they hear. This calms their nerves and allows them to only concentrate on the task at hand.

Reduces Stress

Once again, this does not apply to all kinds of music, but listening to soothing music can really help reduce mental stress. There's a category of music known as "relaxation music" - often characterized by a slow tempo, low pitch, and no lyrics – that has been scientifically proven to reduce stress in individuals. It is often used on healthy people who are about to undergo medical procedures or operations, so they remain calm.

Reduces Pain and Provides Comfort

This goes hand in hand with the same basic principle that music improves concentration, which allows you to become impervious to your surroundings. This allows medical professionals to distract their patients from pain and discomfort. One study analyzed pain management among patients about to undergo surgery by randomizing them in three groups: before, during, and after their surgeries. At the end of the surgery, the patients were asked to rate their pain levels. The patients who listened to music registered much lower levels of pain than those who did not listen to music at any stage of the surgery.

Due to its effect on the human brain, music has been used as a useful tool in patient care. It has been used to help patients during rehabilitation methods and as a coping mechanism during trauma. It provides comfort and has been observed to improve an individual's communication skills. This is because it enables them to effectively express their feelings such as fear, anger, loneliness, and regret. For these reasons, it is frequently used to treat patients who have serious illnesses or those who are in end-of-life care. Music therapy is also used by psychologists and therapists to create a trusting and peaceful environment where their patients feel safe and secure. It allows them to open up and relieve stress, thus creating a more transparent environment where everyone feels safe and secure.

Improves Memory and Cognition

I am sure many of you have experienced nostalgia when you're exposed to

songs you grew up with. This is anecdotal evidence, *that you can verify at home right now*, that music can unlock the brain and tap into long forgotten or hidden memories. Music is also responsible for memory association, which explains why it can remind you of a particular memory or a person.

People with Alzheimer's disease have been observed to recall numerous memories when a song they grew up with is played to them. This is because of our brain's ability to associate music with memories. People with dementia have a similar response when they hear music they grew up listening to. The feelings of nostalgia or any other emotions are stirred up as our brain relives ancient memories buried deep inside the hippocampus. Patients struggling with mental issues can retain their mental faculty when exposed to music.

Helps Children

As discussed previously, music is often used for therapy by medical professionals and in rehabilitation. A growing body of research has found that music also helps children with autistic spectrum disorder. Autistic children who received music therapy, have been observed to improve their communication and social responses. It also helps them in staying alert and attentive on a particular task.

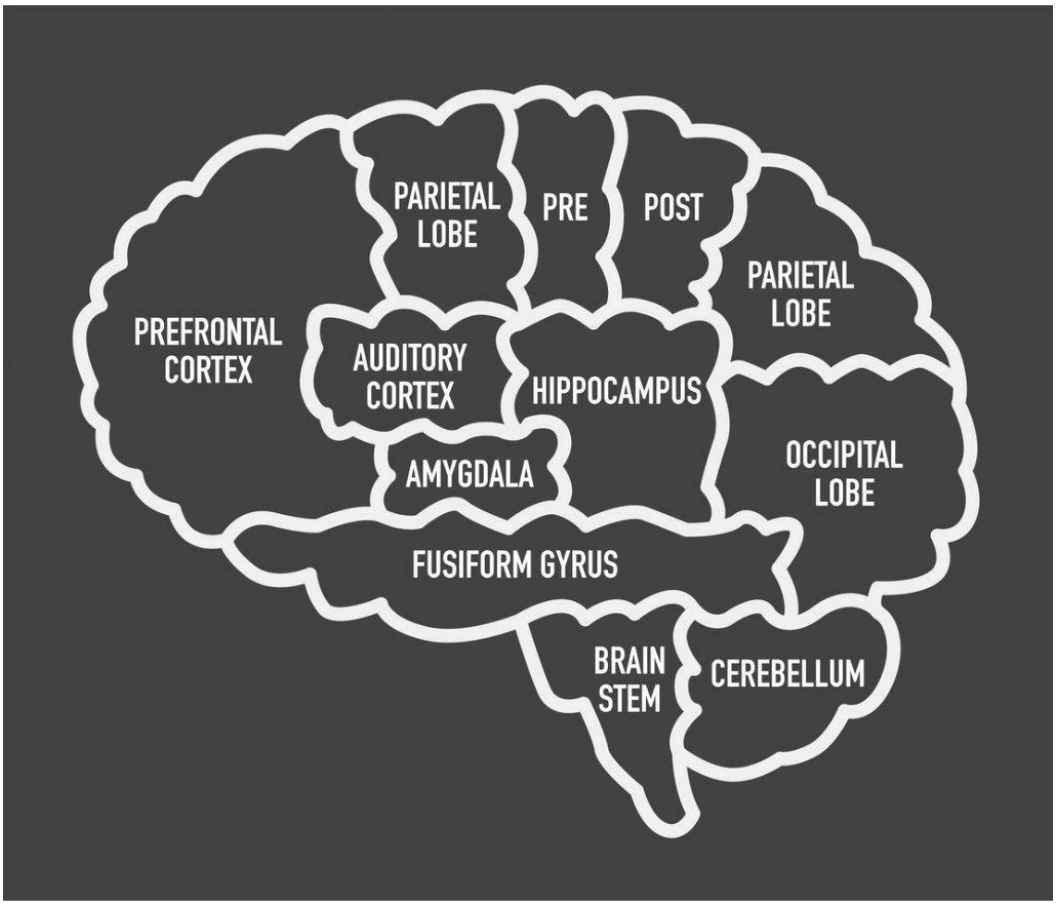
Similarly, the calming effect it has on us is also often used in music therapy for calming down hyperactive children. Music is also effective as a lullaby for children and some studies shown improvements in feeding behaviors, sucking patterns among toddlers, and vital signs.

Given that it has a varying effect on us, we can leverage music to serve different purposes. We can use music as a biohack for better brain health. This, in turn, allows us to regulate our mental and emotional state based on our requirements. Most of us already do this unknowingly to a certain extent but the potential of training our brain is almost endless.

The Science behind the Music-Brain Interaction

It's fascinating to think that our is hardwired to respond to music. Music triggers emotional or physical reactions from us. Typical responses include dancing when hearing music, singing along, or just enjoying the wave of emotions. How does a set of sound waves trigger such a strong response from us? The answer to that question is more complicated.

There are various aspects of the effect music has on the brain that science cannot fully explain, however, there are some that we can. As explained briefly in chapter 1, our brain is made of several components; all with different and complex functions, each responding differently to music. Let us talk about the principals, where science has been able to monitor activity when stimulated by music.



Frontal Lobe

The frontal lobe is perhaps one of the primary distinguishing features of humans as it differentiates us from the rest of the animal kingdom. Humans have a larger frontal lobe compared to other animals and it is used in thinking, planning, and decision making. Whenever we make any decision or choose between available options, the frontal lobe gets called into action. Listening to music has an unusual effect on this part of the brain, such that it enhances its functions. Is it beneficial to listen to music before making important decisions? Arguably so. Not only for its effect on the frontal lobe but also because music helps to get into a state of mindful awareness.

Temporal Lobe

The temporal lobe is responsible for processing auditory input from our ears. This mainly includes the languages that we speak, allowing us to decipher spoken language into sensible words and sentences. Language and words are processed in the left hemisphere of the brain, whereas, music and all other sounds are interpreted in the right hemisphere. It is this understanding of sounds which helps us appreciate music and differentiate the type of music we like.

Broca's Area

The primary function of this part of the brain is to produce speech. Any and every thought we have is translated into understandable language and then put into words by us. It enables us to express ourselves effectively and without problems. Whenever we play music, this is the part of the brain that gets activated the most, which explains why we can communicate so effectively.

Wernicke's area

Wernicke's area comprehends language whether it is in written or spoken form. It basically decodes any form of message in our known language and translates it into a form our brain can understand. It lies in the temporal lobe; thus, it transcodes lyrics so we can analyze it. Wernicke's area helps us appreciate music, so if you like a particular song a little too much, you know which part of the brain to blame.

Occipital Lobe

While the temporal lobe processes whatever we hear, the occipital lobe processes visual input. We can often determine what someone is saying just by watching their lips move; thanks to the occipital lobe. People such as musicians or composers often use the occipital cortex (or the visual cortex) when they listen to music as it helps them with visualization. We often even use it when we need to visualize which instruments are playing in a musical score.

Cerebellum

Our motor skills are primarily regulated by the cerebellum. This part of our brain coordinates movement and stores physical memory (muscle memory), a

routine of movements, which we can perform easily without any effort or focus because our body has learned it. For example, playing a simple tune on the piano or the guitar might be very difficult for everyone at the start, but it becomes easy for them after they get used to it. This is because the lessons and experiences we learn get stored in our cerebellum as muscle memory. It's hard to forget muscle memory even if you stop practicing for an extended period of time.

The link between neuroscience and calisthenics can once again be identified.

We don't forget to ride a bicycle even we've only ridden it once in our childhood. Similarly, an Alzheimer's patient who once knew how to play the piano, might not be able to remember or recognize his family members but, they will still be able to play the piano due to muscle memory. In cases of brain injury or mental trauma, music therapy is often used because it allows the brain to creep out of the darkness and achieve a sense of normalcy.

Applying the same principle to calisthenics, if you learn how to successfully master a Planche, you'll never forget it, and as long as you have enough strength, there is no way you will forget it! I see so many athletes say "I lost my planche'' or ''I lost my front lever'', these statements are totally untrue, what they lost is the muscle strength, not the move itself.

Nucleus Accumbens

Addiction is mostly caused when we get hooked on feeling happy. The release of dopamine triggers a response of joy and pleasure. The Nucleus Accumbens is a region in the brain responsible for seeking happiness. According to studies, music can trigger the same response as drugs and can be very addictive. As discussed previously, it triggers the brain to release dopamine into the bloodstream, increasing its quantity in the nucleus accumbens.

There may be a powerful connection between calisthenics and endorphin release. Dopamine influences plasticity and endorphins which impact the overall mental state.

Most people starting calisthenics get so hooked to the sport, that they get addicted to it. As Grant Cardone rightly said, **be obsessed or be average** – advice to the reader: always choose to be obsessed with your goal.

Hippocampus

Hippocampus is a popular part of the brain and is responsible for producing and retrieving memories along with regulating emotional responses. It is often referred to as the central processing unit of the brain. Some studies show that listening to music allows the brain to open new things creating a more flexible state of mind. Music increases the production of new neurons in the hippocampus which further improves memory and allows it to learn new skills.

Hypothalamus

The hypothalamus regulates various characteristics in the body such as body temperature, growth, metabolism, heart rate, appetite, sleepiness, and mood – among others. It releases the essential chemicals and hormones which are required to do all of this. Listening to classical (or slow music) signals this part of the brain to relax the body by reducing blood pressure and heart rate, for example.

Putamen

Located at the base of the forebrain, the putamen regulates movements and certain types of learning. If you have ever caught yourself tapping your feet unconsciously to the beat of a song, this is a demonstration of a stimulated putamen. This region is responsible for processing rhythm and coordination in body movements. Listening to music increases our response to its rhythm and triggers the release of dopamine in this area as well. Patients who suffer from Parkinson’s disease have poor motor control, but music is used to help them cope with it. It temporarily subdues the symptoms of the disease which is why music is used to aid them in performing certain functions and daily tasks. However, despite the effect it has on their mind, the movements do not last long and once the music stops, the pathology comes back.

Different Types of Music

We all know that musical training causes brain plasticity, for me, electronic music, and more specifically orchestral music such as Beethoven or Mozart transposed into a techno remix have a resounding effect. This probably has more to do with the fact that I was a DJ in my early years, but one thing is for sure, if I want to create an association between a specific movement or skill, I know that music will help me get there faster.

There is a highly publicized set of studies that focus on the effect of different types of music on the brain. This set of research is called the ‘Mozart effect’ and investigate how listening to music increases an individual’s cognitive abilities and spatial reasoning. In one of these studies, a few students took part in an IQ test, but, before they could take the test, they were randomized into 3 groups. One of the groups spent 10 minutes prior to listening to a Mozart piano sonata, the second group listened to a relaxation tape, whereas the third group waited in silence before the test began.

The results showed that listening to Mozart, consistently boosted the test scores of the students and improved their spatial reasoning. The reasons for this result are still unclear but it goes to show you the powerful effects of music on the brain. It has since been dubbed as the “Mozart effect”. It is believed that composing music requires unusual mathematical ability which is perhaps why it has such an effect on our brains. The test was repeated with music from other composers as well but there is something about classical music, specifically Mozart, which boosts our mental and spatial intelligence.

Although it is unclear as to how music conditions the brain, it is argued that listening to music serves as a warm-up for it. It activates certain parts of the brain which are usually responsible for higher cognitive functions. Music helps organize and engage several nerve cells in the right half of the brain which is mostly responsible for sophisticated cognitive functions. Unfortunately, this is not true for all forms of music and only a select few genres of music serve as an exercise for brain cells, thus, enabling them to process information much more efficiently.

Despite the results of the study, a closer look showed that even the effects of listening to Mozart’s music were only temporary, lasting as long as 15 minutes, and provided a very small advantage over the rest. However, learning to play an instrument rewires the brain and enhances neuroplasticity, this in turn makes it easier to learn new skills and perform cognitive functions.

Music for Meditation and Motivation

Several studies depict the effect music has on our mood and on our perception. Music can greatly influence our mental state and our mood, and it is often used to reduce stress and regulate mental behavior, as discussed in previous chapters. Its ability to shift our state of mind is quite similar to

meditation in many ways.

The goal of meditation is to gain control of your mind and influencing it to your own will. You detach from your surroundings and get consumed in your thoughts while still being in control of your brain. Isn't that what music does to our brain?

While listening to some of our favorite songs from our childhood or a new track for the first time, don't we experience a powerful emotional rush? We lose ourselves in the melody and the lyrics. All our problems are left by the wayside, if only for a little while. This is an example of meditation as well.

Meditation lowers cortisol, a stress hormone, in our body which elevates stress levels. It helps us sleep better and trigger positive emotions that make us feel better. All of this is also caused by music.

Soothing your nerves as well as lifting your spirits when you're down depends on the type of music you listen to. Upbeat music with catchy tunes and rhythms help you get moving and feel excited, meanwhile, songs with a slower tempo and without lyrics usually help in lowering our heart rates and blood pressure, which in turn, helps us feel calmer and more relaxed.

It is used to prevent depression and other forms of chronic illnesses, all of it backed up by science, of course. Music-assisted relaxation therapy can improve the quality of sleep for insomniac people and help them overcome sleep disorders. Although it is obvious that music is no substitute for actual antidepressants and insomnia treatment medication, its benefits cannot be underestimated.

A study from Wisconsin observed a group of 45 patients, all of whom suffered from heart attacks in the preceding 72 hours. A group among them was randomly selected and subjected to a 20-minute trial. One group was assigned to listen to classical music while the rest were not. After the trial, the researchers found there was no change in the blood pressure levels of both groups; however, the patients who were listening to classical music showed a decrease in their breathing rates, heart rates, and their hearts' oxygen demands. It is worth noting that any improvements in health indicators of the music-listening patients only lasted about an hour after the music was stopped. Regardless, it just goes on to show the effect music can have on patients and its implementation in meditation.

One of the greatest reasons for losing our motivation to do anything is because it becomes part of our routine, resulting in a net loss of interest. This causes fatigue and it is perhaps the greatest killer of motivation. In such circumstances, although taking a break and sleeping for a while is the best option, it is not always possible or advisable. In that case, what you can do is listen to music that gets you out of the boring loop and refresh your brain.

Listening to music brings something new for the brain and affects our mental health in a positive way. This energizes the brain and the body by distracting it from the boring aspect of a task. This fuels your brain which then signals the body to resume the seemingly boring activity.

The exact same principles apply when you're running or jogging while listening to music to stay motivated. The link between the auditory neurons and the motor neurons in the brain gives you the extra push you need to run just a little bit longer or just a little bit faster. The state of mind you are in sparks your physical activity as well. This is why many fitness centers and gyms feature upbeat funky songs so that everyone is motivated when they workout. Many HR managers incorporate music therapy in their offices and often observe an increase in the productivity of their employees.

Moreover, music increases motivation by improving motor coordination. You might find that moving to the beat of the music becomes easy and lifts your mood. This is because moving to the beat of the music not only improves motor control but also boosts your self-esteem and confidence. Both qualities are linked to our self-image, which when boosted makes us feel good.

The possibilities in which music can trigger plastic changes in the brain are endless. It's why music serves as such a convenient biohack which can easily be used by everyone with great results.

So, go play some funky beats on your headphones and give your brainwaves a good boost!

Chapter 8: Meditation – The Best Hack

We're all familiar with meditation and have heard (or even read about it) in lifestyle magazines, but most of us haven't really gotten around to practicing it all that much. Most people have a general idea of what meditation is but do not really understand it.

It is one of the greatest spiritual practices known to mankind, which is why I would say that despite being popular, it is still underrated. It provides amazing holistic benefits and wellness, but we still do not practice it in our daily lives.

What Is Meditation?

Let us take a closer look at what meditation really means. According to Cambridge dictionary meditation is defined as:

"The act of giving your attention to only one thing, either as a religious activity or as a way of becoming calm and relaxed"

Simply put, meditation is a deeply psychological exercise, including deep breathing practices and deeper thinking tactics which are used to improve awareness and attention. It also regulates mood and improves the control over the brain; allowing us to biohack the neuronal pathways residing in our brain. It encourages the use of mindful practices which deeply elevates the level of enjoyment in daily tasks and activities as well as aids everyone to live their life in the present tense to the fullest of their potential.

Throughout history, there have been various practices adopted by numerous cultures of meditation. Some of these practices often date back to around 5000 years ago but the actual date from when this practice originated is still unknown. Despite its ancient origins, meditation gained wide popularity and became well-known due to Buddha. He had a great impact on meditation and improved it to maximize its mental benefits.

It was first only known in the region of Asia but soon became widespread throughout the world once its benefits were popularized.

Meditation doesn't mean you're getting zoned out or 'detaching' yourself from everything else except for your basic necessities. It won't give you earth-shattering experience on life or let you in on the secret meaning of the universe. It won't necessarily make you a better person, a different person, or even a new person. Quite simply, it is a spiritual experience which aids in understanding the mind and training in awareness. Instead of controlling the mind it mainly focuses on getting to know yourself and your surroundings. Working with the mind results in an individual valuing human quality such as empathy and patience along with an improved sense of awareness, attentiveness, calm, and presence.

It understands that not all things in life can be controlled, rather it is better to understand and embrace them. It guides an individual to not force or block any type of thoughts rather, to let them flow freely.

This approach of meditation changes one's mindset which in turn transforms their perspective at how they look at different things in life. Seeing that happiness and joy are nothing more than just a state of mind, this approach works even better than medication for patients who have depression, anxiety, and other mental health issues and can go a long way in preventing them from relapse.

It is a technique where you learn to be more aware of your thoughts, breaths, surroundings, and people around you.

Benefits of Meditation

There is a reason why meditation gained so much appreciation around the world in such a short amount of time. Some experts believe it is more effective than medications for mental health patients, which is why it is communally adored. Its effects do not end when you stop a meditation session, its benefits transcend the duration of its application.

Whenever you meditate, you remove the rubbish of overload that builds up every day in your brain contributing to pent-up stress. Instead, you feel a sense of calmness and serenity during meditation, which allows for a clearer head and a clearer mind for decision making. It impacts your emotional wellbeing in a positive way and encourages you to be content in any

situation. It teaches an individual that being happy, and content is just a state of mind and instead makes you focus on what really matters.

The approach outlined by meditation helps individuals manage stress, sadness, hopelessness, loneliness, and so on. This elevates your overall mood, which influences your daily activities, and perspective. The MCBT (mindfulness-based cognitive therapy) in meditation not only helps overcome mental health issues, but also proves as an effective preventive tool and tactic against relapses and recurring depression. This is because it deals directly with various mental illnesses by addressing the root cause of an individual's thinking. It interrupts the thought rumination process and allows the person to guide their own way of thinking.

However, that is not the extent of its benefits; meditation may go as far as to help an individual improve their sleep levels. An improvement in one's mental state and perspective also influences many other activities such as sleeping. Meditating every day, especially at nighttime, further improves your sleep levels. The deeper levels of rest will allow your body to replenish its energy and repair/restore various tissues and cells.

Since it relaxes and calms the mind and body, it reduces the risk of developing diseases that are caused by or are worsened with stress. Some of these include anxiety, high blood pressure, heart diseases, depression, sleep problems, chronic pain, and asthma, among others. Various studies have established a direct link between controlling blood pressure and meditation.

Meditation does not serve as a substitute for medication, in most cases, but it surely can supplement your regular treatment. It brings about a change in mindset for an improved lifestyle. It helps you realize what truly matters and what does not, along with choosing to find happiness from within. This increases the brain's plasticity, imagination, and creativity. By being aware of the people in your surroundings, meditation prepares you to be more patient and tolerant towards others.

Meditation can also improve health indicators in your body. For instance, by meditating every day, you can not only regulate your blood pressure (as discussed earlier) but also improve your immune system.

Types of Meditation

Since meditation has been a part of human civilization for thousands of years,

you'll find different types and techniques for this process developed over time. It's highly recommended to try different types of meditation until you can find the one that works best for you.

These 7 different forms of meditation namely include,

- Mindfulness meditation
- Transcendental medication
- Guided meditation
- Vipassana meditation
- Loving kindness meditation
- Chakra meditation
- Yoga meditation

It is worth noting that you'll find other variations of meditation, but the ones mentioned above are essential to Neuroscience Calisthenics. So, let us focus on them first.

Mindfulness Meditation

Mindfulness meditation is a type of meditation that deals with being present in the moment with your thoughts. The awareness value is given high priority in this type of meditation as being mindful means also being aware of your own surroundings. This can be further explained by being aware of what you are doing and where you are. It incites a sense of true calmness as it pushes you to be more aware of what is happening around you, without coming under its influence. You must accept your surroundings and let them be, without letting anything offend you or reacting to it in any way. Just be aware of it and not be affected by it.

It involves being fully focused on the 'now and then' so you can to register your surroundings, your thoughts, and your feelings without any sort of judgment, whatsoever, from yourself. It is a mental training practice, which deals with teaching you to ignore any negativity and slow down your thoughts. This enables you to really slow down racing thoughts and be aware of what is going on inside you, which also calms down your mind and body.

One of the benefits of this type of meditation is that it can be performed anywhere and anytime. Mindfulness techniques are different and varied but there is usually a general approach in practicing it.

To do this, you need to sit in a comfortable place have a few minutes of your free time. Once you do that, you need to let loose your thoughts without being judgmental or negative in any way. Let your mind and your emotions wander and become aware of what is happening without passing any judgment. To get started, one of the best ways of doing this is to focus on your breathing.

You can do this practice while commuting, traveling, eating, or whenever. It does not require any props such as candles, mats, oils, or mantras, necessarily. You just need to be in that mindset to meditate.

Vipassana Meditation

The word “Vipassana” is essentially a Buddhist term which literally translates to “special-seeing” or “clear-seeing” and “insight”. The Vipassana Meditation is an Indian ancient technique of meditation originating more than 2500 years ago. This type of meditation teaches people to see things the way they really are. It is one of the oldest forms of the art and even the mindfulness meditation movement, which is mainly practiced in the United States, has its roots in this tradition.

The Vipassana meditation aims to guide its practitioners towards self-transformation and it does this by using self-observation. The technique teaches its users to be aware of their surroundings and to practice disciplined attention. Those who practice this technique can establish and enjoy a deep connection between their mind and their body. They can look at things from a new and refreshed perspective.

This outlook allows the meditators to look at reality in a new light and to break away the wall of illusion. It requires giving careful attention to themselves and to their surroundings and having a good level of awareness. The level of intense interconnectedness gives way to a mind that is balanced and is full of love and compassion.

This technique is not only gentle but also thorough and detailed. It is a system that engages the meditator through a set of exercises which encourages them to delve deeper and explore their own life experiences. It hones your senses

using attentive listening, mindful seeing, and careful testing of its results.

It allows one to unlock their mind's hidden potential and gain insight into a deeper sense of everything. By doing so, meditators can achieve a heightened sense of attention and focus. They do not just go through life experiences; they pay attention to everything that goes on in it and understand it better.

People who practice Vipassana meditation make use of focusing on one's breathing to achieve a balanced state of mind. Diving into the realms of your own mind is often dangerous and going there unguided can lead you to places you might not like. That is why unstructured meditation is often difficult and instead the practitioners of Vipassana meditation use breathing techniques as their focus to steer clear of any such issues.

Yoga Meditation

Yoga has become mainstream and more popular than other forms of meditation. This is a recent trend and yoga wasn't trending until a few years ago. The practice of yoga dates to ancient India, probably because of its deep spiritual connection with the region.

A common misconception on yoga is that it's just another form of exercise. However, this is a gross generalization because its roots are extremely spiritual, and it incites mental, spiritual, and physical improvement.

There are several different styles and classes of yoga that have been developed around the world. All of them involve a series of postures and controlled breathing exercises. These exercises not only improve physical flexibility in one's body but also calm the mind. A high level of focus and concentration is required to perform such exercises along with a fair amount of control over balance.

This engages the meditators' whole body and allows them to shift their focus on things other than the distractions in their surroundings and stay in the moment. Although the physical poses and movements are not mandatory for meditation, they are supportive and helpful in the process. By practicing yoga, you enhance your ability to concentrate and to relax which are two of the most important requirements for practicing meditation. They both go hand in hand with each other.

While meditation requires focus when while sitting still, yoga requires you to

focus on your postures, movements, and breathing. Meditation encourages you to let your mind run free and to remove any judgment of thoughts, whereas yoga diverts the mind from the distractions around the meditator. Although there are different types and forms of meditation and yoga, this holds true for almost all of them.

The poses and exercises performed in yoga depend on a lot of factors, including your health. Not everyone will be able to perform complex poses in yoga meditation, which is why you should focus on the easier postures first. There are various simpler poses and movements for beginners which can guide them into the technique and allow them to slowly ease into it.

How to Get Started

You can find a large number of YouTube tutorials, blog posts, podcasts, and tutorials that will guide you on the different ways to meditate but, the vast pool of information available on the internet may be too overwhelming for some. Among those, some YouTubers will teach you bizarre ways of performing meditation in order to achieve a healthy and calm mindset. Not all of these techniques will be compatible or doable for you. Obsessing over these advanced poses is counterintuitive to the goal of meditation and yoga – our goal is to ease the mind, not add more stress to it!

Meditation promotes a calming and relaxing approach towards life and towards anything that you do. At the very basic level, meditation is all about you and there is no one set-out way in performing it. Approaches differ from one person to the other depending upon their personality, ability, psychology, and upon various other factors as well. There is no right way to pamper and condition your mind with meditation. All the varying approaches have been developed from a unique perspective and provide different pathways to lead you to the same goal – a healthy, calm, and balanced mindset. It is the perfect way for you to understand your brain, which is why it serves as one of the best biohacks in the book.

Despite the differences in its approach, there are a few basic steps that you can follow to begin meditating.

Having an Objective

Before starting the session, determine a specific objective and keep it in your mind as you step into the mindful state. This step may help achieve results

much faster, since you keep a goal in mind throughout the adventure, kind of like a “destination” on a map for you to reach. Visualizing the destination always helps you in getting closer to it. It not only guides you to the objective but also keeps you motivated to reach where you want to.

Make Yourself Comfortable

Our primary objective in life is to gain comfort since being comfortable reduces many external distractions. In order for meditation to work, you have to first become comfortable in your own skin. Do whatever that makes you comfortable. Put on fuzzy socks, lie down, sit up, close your eyes, put on music, or do nothing; it is all up to you. Put yourself in a point or place where you feel comfortable and vulnerable so start exploring.

Practice Deep Breathing

This is something that will help you a lot in life and will also serve as an important step in achieving relaxation. Pay attention to when you breathe. Take a deep breath and focus on how it feels inside you, turn your thoughts towards retaining the air for a few moments. Finally, extend the breathing out part of the process as long as you can. This enables you to calm yourself and your mind and places you in the perfect state to meditate.

Let Your Thoughts Flow

You need to familiarize yourself with your own thoughts in order for meditation to work. Your thoughts should be as fluid as air. You should be kind to yourself, and not block out, or push away your thoughts. It is important to just acknowledge them as they are and not judge anything. Let them float through your mind freely, without controlling them. Meditation is a safe space for your thoughts to flow in free form.

There are no negative side effects of meditation – at the end of each session you will come out stronger, better, and wiser. It serves as perhaps the greatest hack in training the brain to become better. So why not try it now? There is nothing stopping you. You deserve to become a happier and healthier version of yourself.

Chapter 9: Biofeedback – Monitoring Mind Over Body

Biofeedback is essentially a technique used by many people to gain control over the involuntary functions of their bodies. It allows them to have a greater awareness of different physiological functions of their body to manipulate the body's systems at will.

Mind over body is the true fundamentals of Neuroscience Calisthenics.

Can you imagine being able to lower your heart rate by your will? As discussed in one of the earliest examples given in the book, deep-sea divers can hold their breath for a really long time. The record for holding their breath underwater is of 22 minutes, whereas normal people are only able to hold their breath for an average of half a minute. This is because the record holder could manipulate his breathing, heartbeat, blood pressure, body temperature, muscle tension, and other processes in the body. That is why he could conserve the oxygen in his lungs and maximize its use in the way that he did in his record-shattering performance, this type of conditioning and training is possible only by biofeedback.

It basically works by utilizing various electronic diagnostic instruments or measuring different psychological readings of the body. I initially started monitoring my body, like pretty much everyone, using a Fitbit tracker. This smart gadget was GPS enabled and could monitor my heart rate, steps, sleep, workout modes, and calories… But I stepped up the game with my Christmas present, adding the Hexoskin Smart Shirt to my Biofeedback monitoring. This one is capable of accurately tracking an array of biometric data. This Garment is a daily activity and sleep tracker to monitor the evolution of your health condition over time. The Hexoskin Smart Shirts continuously tracks cardiac, respiratory, sleep, and activity data using ECG & Heartbeat, Heart Rate Variability (HRV) (allowing stress monitoring, effort, load, and fatigue assessments), QRS events, and Heart Rate Recovery;

- Breathing Rate (RPM), Minute Ventilation (L/min)

- Activity intensity, peak acceleration, steps, cadence, positions, and best sleep tracker

These devices work by using sensors that can pick up signals to reflect your health condition. For example, a heart rate monitor detects and measures how many times your heart beats per minute. You'll typically wear it around your chest or finger for the best results. Someone might monitor their pulse while measure it's response under strenuous exercise. There are numerous ways in which these devices can be used by different people.

Not only heart rate but brainwaves can also be monitored with special instruments that can measure how your brain behaves in different situations. These instruments can "feed-back" the information that they collect to the user. Various activities are performed separately during observation to see how the brain reacts to each of them. The results are presented in graphical form to be better understood by the user. The presentation of this information is synchronized with changes in thinking, emotions, and behavior and supports the desired psychological changes.

Types of Biofeedback

Biofeedback can be used in numerous ways, depending on the application and the user's requirement. The approach or the method that you ultimately use might be based on your own objectives and your physician's recommendations. I am going to tell you about some of the more common types of feedback explain their function.

Heart Rate

Heart rate biofeedback is measured with a sensor which is placed on the wrist, torso, or chest. It also checks the heart rate variability along with the heartbeat. It usually gives auditory or visual signals as feedback to the user that reflects the changes in their behavior with the changes in other parameters.

Breathing

Respiratory feedback involves sensors that are designed in the form of bands. These sensor bands are wrapped around the abdomen and chest area of the user. They monitor breathing rates and patterns and can also be used to see how an individual's breathing is affected during an activity.

Skin Temperature

Although the name suggests that the sensors detect the temperature of the skin in this form of biofeedback, the sensors usually detect the amount of blood flow to the skin. These sensors can usually be worn anywhere on the skin and can be used to monitor symptoms of various issues as they relate to body temperature.

Blood Pressure

These devices are common and used just about everywhere. They contain sensors mounted on bands, which are worn on arms or wrapped around the chest to detect the blood pressure. They can be used to detect when the user is starting to feel nervous or anxious, or even stressed.

Brain Waves

There is a separate name given to this type of biofeedback, which is neurofeedback. They're gaining widespread popularity and trending everywhere. These devices utilize the process of electroencephalography, commonly known as EEG, to detect brain waves and display them to the user. Brain wave studies are utilized in various medical applications as they serve as a non-invasive alternative to treating and diagnosing various mental illnesses such as depression, anxiety, addiction, and ADHD, among others.

Muscle Tension

Muscle tension feedback is useful for a growing range of applications. It uses a few sensors which are attached to several places on the body and are then connected to an electromyography device, also known as an EMG device. It detects changes in muscle tension by monitoring the electrical signals sent by the brain and displays this information to the user.

Skin Conductance

Skin conductance, also known as galvanic skin response (GSR) plays a vital role in the application of biofeedback, as it offers a unique method of measuring the skin's electrical currency, a property differing based on the moisture content. Skin conductance itself is measured by the unit **µs.**

Moisture levels are based on the activation of sweat glands, controlled by the nervous system, reacting to each emotion, from happiness, giddiness, and joy

to fear, nervousness, and awkwardness. With the use of a tool that uses skin conductance, you can directly spot and understand emotions your brain goes through, simply through the electrical conductance of your skin.

Application of Biofeedback

The applications and uses of biofeedback are spread over a wide range and they vary from medical applications in health care facilities to personal health care gadgets and equipment. Their medical applications mostly include monitoring patients and observing their vital signs as well as other signals that their body gives off. These applications can tell a lot about a person's health and condition. They also serve as a worthy substitute to intrusive methods of diagnosis.

They can be used to aid in the treatment of tension headaches, migraines, and pain. Respiratory behavior, brain waves, and blood pressure can all reflect a person's state of mind and body.

Analyzing how your heartbeat behaves in response to a certain mindset allows you to counter the symptoms of such illnesses. Once you can control these involuntary responses of your body, you can use this ability to mitigate the effect of such a problem.

For example, if you know how breathing can control your brain activity, you can easily counter the effects of depression or anxiety by focusing on your breathing techniques. Similarly, if you are aware of the effect a certain type of music has on your heart rate and blood pressure, you can listen to the appropriate type of music whenever you're doing a workout or need to recreate after a stressful day at work.

These reactions of the body are scientifically explained as a fight-or-flight response. The body tends to trigger this response whenever it feels potentially threatened. By learning how to identify the signs of these conditions, people can learn how to relax and calm themselves in various situations.

The applications of biofeedback are only limited by how you utilize it. You could potentially control high and low blood pressures if you are already aware of what affects your body in what way. This is all possible due to biofeedback!

Many rehab and recovery programs offered at mental care facilities also rely

on this biofeedback to help their patients. It helps them control and counter physical reactions to stress or anxiety.

Being able to alleviate the symptoms of anxiety, such as tense muscles and overthinking, helps the patients in recovering and overcoming the root cause of their problem.

The blood pressure and heart rate of a body are also related to the digestive functions of the body. This means that any digestive disorders such as irritable bowel syndrome can be eased by utilizing biofeedback. By simply understanding how your body reacts to certain stimuli, you could attain more control over your health issues.

Brain injuries and mental trauma are particularly hard to diagnose when compared to physical injuries. However, EEG biofeedback has proven to be very helpful in such cases as it helps quantify and measure brain activity. Neurofeedback is also helpful in identifying and then addressing various other mental disorders including attention deficit disorder, depression, and post-traumatic stress disorder.

Biofeedback is also frequently used by therapists to treat patients and to help them control the responses of stress and even anxiety attacks. Chronic stress, if not addressed properly, can lead to a range of health problems in the long run including and not limited to sleep disorders, heart disease, digestive problems, and weakened immunity.

Managing the stress responses by monitoring how your body behaves can not only help you to counter the symptoms of stress but also potentially prevent these problems from occurring in the future. This technique can be applied either by a biofeedback therapist or by yourself at home with certain in-home biofeedback devices that are easily commercially available.

Biofeedback therapy is a form of training instead of a treatment since it teaches you how to understand and control yourself **by yourself**. It can often serve as an alternative or a supplement to other treatments. It is preferred by patients because of being non-invasive.

I encourage everyone to try biofeedback therapy in various situations to gain better control over your mindset and to unlock the hidden potentials of your abilities.

In conclusion, Biofeedback is used by many top performers as a control technique of one's bodily functions, making it a powerful and scientifically backed up bio-hack. Utilizing such a powerful tool in your daily life aids in grasping a greater concept of your mind and body, understanding it, and reading it. From managing multiple health issues such as high blood pressure to IBS, strokes, Raynaud's disease, and more. And for my concerns, it has also been proven effective in the management of ADHD, ADD, and anxiety.

Apart from its varying benefits, there are multiple positive sides to this method of biohacking. Firstly, it is non-invasive making this an accessible and safe choice for whomever it may benefit.

Secondly, it gives a feeling of power and control by the people using it, making them feel like they are truly able to understand themselves, finally, it may reduce the need for medication as well as enhancing its powers.

Chapter 10: Testing Biohacks and Their Results

Throughout this book, I have guided you on how to achieve a healthy mindset that enables you to have a healthy body and to that end, I highlighted different bio-hacks for you to test out. The reason why so many people rely on biohacks is because they're a convenient alternative to developing and enforcing the kind of discipline needed to create a healthy lifestyle. A biohack lets you exploit the biology of your body to "cheat" your way to health, but without the extra difficulty.

I have tested various bio-hacks myself, which is why I'm a better 'guide' in this regard. With the goal of pushing human performance forward, I have done all sorts of experiments to optimize my body, to achieve peak performance, and upgrade my physical as well as mental health. Always with a focus on scientific studies, statistics, and data science, any recommendations I make in this book or on my blog, are based on methodical approaches and validated information and finalized by self-experiments in the name of science!

I will tell you the science behind each of them, how they affected me, and their results.

EEG Headsets

Electroencephalography, or EEG, headsets are devices that serve as a convenient means of bio-hacking the brain. I used to wonder if it was even possible for EEG devices to improve mental and physical performance during workouts. To find out the answer, I decided to test them on myself.

EEG devices can read and adjust the brainwaves to manage one's mood, energy levels, and performance, just like stimulants in coffee. Using technology to control the human brain may sound too good to be true but it is not. We now have access to technology that is blurring the line between sci-fi and reality. An EEG headset does exactly what it sets out to do: 'hacking' the brain's waves to help you focus on the task at hand. In this case, workout.

Using EEG headsets may be the difference between squeezing out that extra rep and going all-out than giving up mid-rep because you feel exhausted. The human mind subconsciously decides to hold back when the workout routine gets too boring or too tiring. This affects your progress and your gains. This is where EEG headsets fit in. We all face concentration and focus problems because of endless distractions pulling us in every direction.

EEG headsets have made generational leaps when it comes to progress, going from niche gimmicks for hardcore biohackers to highly efficient meditation devices that now cater to a rapidly growing market.

EEG headsets let you alter your state of mind to one that is favorable to a workout routine. It is worth pointing out that you cannot and should not wear EEG headsets during a workout routine because movement will interfere with electrical signals. Use the headset to train your mind into a heightened state of focus and concentration to achieve your workout and day to day goals.

Tapping into Brain Waves

The concept behind EEG headsets sounds like it was pulled straight out of a sci-fi world, which it is, but it has got hard science backing it all the way. EEG, short for electroencephalography, is a technique that lets you record and measure brain waves. It has traditionally been used to diagnose strokes, epilepsies, and even brain death.

But manufacturers got the bright idea of tweaking EEG devices to help with everyday tasks and performance.

As already explained in this book in the sleep chapter, there are five types of brain waves:

- Delta waves are usually associated with deep sleep.
- Theta waves, observed with sleep, deep meditation, drowsiness, and occasionally, creative states and relaxation.
- Alpha waves are observed with light meditative states and relaxation. They are used to trigger a state of productivity and focus. They are produced more often when the eyes are closed.
- Beta waves are observed when the person is moving around and

anxious.

- Gamma waves, rarely seen but they play an important role in higher learning.

Biofeedback diagnostics lets you track all 5-brain wave types and gives you insights into your focus and concentration levels. Furthermore, EEG devices use sensors to measure your brain waves and then stimulate your energy levels to manage your mood with your thoughts alone. By comparison, you would need a considerable number of stimulants in the form of coffee and tea to reach the same levels of improvement in concentration.

It is worth noting that brain waves are still not fully understood and generally only deal with delta, theta, alpha, and beta waves. Gamma waves are poorly understood and are not associated with any mood.

EEG headsets work by harnessing measurements captured from the brain. This data is then used by the accompanying app to play certain games, an exercise that will flood the prefrontal cortex with oxygen and blood. This can reportedly provide the brain all the motivation it needs to carry out the task at hand, it could be a workout routine, completing an assignment, work-related job, or something as simple as going to sleep.

There are several ways in which EEG headsets can prove to be useful for neurofeedback:

- Helping you with stress to relax, altering the brain waves from beta to an alpha state.
- Helping you fight feelings of lethargy, primarily due to an alpha or theta state.
- Helping you relax and fall asleep on command, by dropping down to the lower theta state.

By learning how to control the EEG device, you can train your brain to do exactly what you want.

Personalized - Based on the Individual Wearer

As with most things in life, you get what you pay for. Many of the high-end devices are particularly advanced and offer incredible sensitivity with lots of sensors. The tradeoff is that it takes longer to dig the sensors into your scalp to get accurate brainwave readings and analyzing the data.

The big names in the market right now are NeuroSky, Muse, and Thync, and Neuroelectrics, each offering their own set of unique features. Low-end devices will unsurprisingly, have the lowest number of electrodes to use. This will affect the accuracy and performance. Most devices offer a limited number of channels, with some only offering 6 to 10 and others offering over 64 channels.

Diving into the Disadvantages

The technology for EEG devices is pretty impressive and lets you train the mind to perform better at the gym, but there are a few technical challenges that they need to overcome.

EEG headsets do not provide the same level of coverage as professional EEG systems. They are designed for ease of use and to be put on much faster. Furthermore, the electrodes in EEG headsets are not placed by hand, and instead, are placed in a predetermined position set by the manufacturer. That being said, the electrodes are somewhat adjustable and flexible to accommodate different head shapes and sizes.

Another big limitation is that EEG headsets are easily subject to ‘noise’ from outside electrical signals. While commercially available EEG devices have plenty of shielding to minimize electrical interference, most typical EEG headsets do not have nearly the same level of shielding.

In my honest opinion, EEG headsets are novel devices that have all the science and research they need to ‘train’ and manage the human brain. The cheaper models tend to be a little lackluster with just a few electrodes which means you will not get the same level of performance. But expensive models, which are aimed at the hardcore user, will let you supercharge your brain and improve athletic performance.

As out-of-the-world as it sounds, EEG devices may well be worth your investment.

Transcranial Direct Current Stimulation **(tDCS)**

I have experimented with a few devices that utilize biofeedback as a technique. Besides the devices mentioned earlier, there is this unique tool that targets the brain waves, the Halo Neuro Headset, also called the HaloSport2.

A few years ago, I heard about a new hyper plasticity stimulator. This, of course, piqued my interest and as I started collecting data and information about this device, it became obvious to me that it was nothing like I experienced before. It appeared to be the first hyper plasticity stimulator that goes straight to work on our cerebral cortex and has a load of trustworthy studies backing up its efficiency.

HaloNeuro uses a form of brain stimulation known as transcranial direct current stimulation (tDCS).

Neuroscience studies demonstrate that tDCS increases the brain's neuroplasticity, to create and strengthen motor pathways faster.

It is called hyper plasticity, or hyper learning.

But, my main concern with tDCS was also based on the neuroscience studies, more specifically, the ones discussing the enhancement of beta oscillation used to induce Parkinson's disease (PD) in rodent models. Patients with Parkinson's disease show enhanced beta oscillations in the motor cortex, so I was reluctant at first about sending waves and electrical signals to my precious brain.

Then came across this interesting article (the original study), which showed an increase in beta frequency in the somatosensory cortex following air-puff simulation on the fingers. It was brought to me by Rachel Samson, a neuroscientist who widely contributed to my education in the field of neuroplasticity.

Her study showed a similar pattern in rats (increased beta oscillations), following odor stimuli. We came to the hypothesis that there may be a link between beta oscillations and sensory learning – giving me just enough clues to go ahead with this experiment.

The role of oscillations is believed to synchronize the activity of distant brain regions, sort of, binding them together. Think of the brain as a collection of different systems or networks that serve different functions.

Halo Sport2 uses neuro-stimulation to boost learning in your motor cortex for a period of 20 minutes, a process known as neuro-priming, and gets your motor neurons excited. The claim is that Halo Sport2 puts your brain into a state of heightened plasticity known as “hyper plasticity” or “hyper learning” for up to an hour.

During this time, the brain's ability to adapt to training becomes more potent, allowing an athlete's brain to learn quicker and achieve faster results.

But, good things in life aren’t just handed over to you on a silver platter; if it does, chances are that it’s going to backfire sooner or later.

Halo Sport2 will not magically transform you into the strongest athlete in a single session. What it will do is, improve your performance gradually over time, on the assumption that you will also work on your own self-improvement. It will take hard work, sweat, and consistency, but if you put your mind to it, anyone can achieve the highest possible levels of strength. Calisthenics is all about strength training. You make use of your own bodyweight to develop flexibility, power, and stamina.

Mastering calisthenics is a process, often a long one, but if you stick with it - it can be incredibly rewarding.

tDCS devices, including Halo Sport 2, work by applying a small electric current to the part of the brain that controls movement, activating neurons so they fire more often when you train.

The theory says that in order to gain strength, your brain needs to send stronger signals to your muscles. With tDCS your brain strengthens that signal faster than it would without it.

At the end of a workout, your brain sends weaker signals to your muscles, so you feel fatigued. With tDCS your brain learns to maintain stronger signals throughout the workout. This allows the building of endurance, a key component to train in any workout.

I learned that brain stimulation is key to learning faster, aging slower, and sending energy to the brain in an instant. I studied neuroplasticity at a laboratory level, but I realized going through my own personal journey was crucial for me!

I have been an unbiased witness towards its fascinating results, and I can confidently say it's not a scam or just another marketing scheme, it truly scientifically works to improve and conjure neuroplasticity in the brain by using electrical currents.

Cold Exposure

Cold showers are by far the most effective, inexpensive, and natural bio-hack there is. Its multiple benefits are often ignored and often overlooked because they're so outlandish. Indeed, the health benefits of a simple cold shower are quite incredible, free, and easy!

In the last twenty years, cold has been promoted everywhere, from cryotherapy to cold baths and everything in between. Chances are, you've probably heard about some benefits of being exposed to cold.

As a matter of fact, scientists have been extensively studying the impacts and benefits of cold therapy. From potential fat-burning qualities to strengthening the immune system, there's enough incentive here to spend more money into these research programs. Cold exposure leads to increased nitric oxide production - the same libido activator that's triggered by the blue pill for men - but also known to decrease inflammatory cytokines and joint pain, and increase sympathetic nervous system activation and an overall reinforcement of body and cellular resilience to bring about an anti-aging effect.

However, before exposing your body to the cold, there are some important precautions to take, therefore as a scientist, please allow me to take you through a brief history of cold exposure, and a cursory glance at where all these benefits come from.

Cold therapy has been among the earliest medical treatments, dating back centuries, over 3500 BC, and has been mentioned in ancient medical texts as a form of therapy.

It was only in the late 80s that cold therapy saw use as a therapy in preventing neurologic injuries.

We are all very familiar with cold therapy in the sports industry. Known for its power of reducing blood flow, swelling, or spasms, cold therapy has been proven to accelerate the recovery process after surgery or an accident. In terms of science, exposure to cold impacts some muscular enzymes.

Benefits of Cold Exposure

Fat Burning

Possibly the most sought-after goal in the fitness industry, from gadgets to unhealthy diets, the world is obsessed with losing weight, possibly influenced by social media and society itself. It is important to keep in mind that not every diet is healthy – especially fad diets that promise you'll lose over 70 pounds in a week – losing a tremendous amount of weight is either too dangerous, a bunch of lies, or simply a waste of time and money.

But who would have guessed that taking a cold bath/shower could achieve these results in a safe and natural way? Cold thermogenesis activates the brown fat, ridding you of white fat, as well as increasing calorie loss.

However, as amazing as these sounds, it also has a few negative points mainly because it's discomforting to some people. Not everyone can enjoy taking a shower with freezing water, and it also takes a considerable amount of time to see results – requiring at least 6 weeks of daily use. Our body stores brown adipose tissues (BAT), unlike white fat - which forms the bulk of your energy reserves, and represents the majority of your body fat - brown fat activates more calories.

BAT can actually convert calories from food to heat. See the point? Cold exposure increases BAT activity, which translates to burning calories. It has been proven that frequent cold exposure might be the most economical way to address obesity. With the weather we have in Canada, this country could soon become a tourist hotspot for anyone looking to lose weight.

The same research concludes that a lack of cold exposure could be linked to obesity.

The process behind this is very simple. Shivering increases thermogenesis which increases calorie burning. There is a protein linked in the process, called adiponectin, which increases the rate of fat burning. By contrast, a low level of adiponectin is associated with obesity. Science is quite straightforward, isn't it?

Another benefit of cold exposure is inflammation reduction. Here also, the protein is known as adiponectin that combats inflammation.

The following benefit relates directly to the Neuroscience Calisthenics concept, namely longevity.

Multiple studies discovered an obvious relationship between temperature and the lifespan of insects and animals: environments with lower temperatures lead to longer lifespans. The theory behind this is that longevity is promoted by slowing down several metabolic functions and modulation of gene expression.

But that is not all! Adiponectin is also involved in blood sugar levels. Cold exposure increases glucose uptake in the peripheral tissues and enhances the response to insulin, which clears glucose from the blood.

I’m also seduced by its impact on the nervous system fat burning is linked to our sympathetic nervous system (SNS). Any cold exposure is, therefore, a nice and smooth exercise for our system, forcing the body to adapt to cold temperatures that we are exposed to.

Some interesting studies have found that cold therapy strengthens the immune system by increasing the level of T&B lymphocytes among others in our system.

Performing calisthenics beforehand enhances the immune-stimulating effects of cold therapy - a good idea, then, is to jump in a cold lake before exercising. I actually have started incorporating this technique into my routine.

In conclusion, I am not asking you to jump in an ice-cold lake or immerse yourself into a bath filled to the top with ice. That could be very dangerous, and even fatal for some individuals because of how it impacts the heart, also known as a cold shock response.

It is important to gradually adapt your body to cold exposure. To achieve this cold thermogenesis, practice only one to two minutes of cold shower or alternate between cold and warm water.

Alternately, bathe as usual but finish with a cold shower. Start practicing with short 30 intervals and gradually work your way up to a few minutes overtime.

Of course, the temperature of the water varies depending on where you live,

my shower at the cottage is about 5°C and 12°C is the coldest it gets in the city, which I consider warm.

These are all the reasons I love cold showers, the cheapest and most accessible bio-hacks around!

Nootropics

Nootropics are pills for the brain that make those 16-hour workdays possible. For the uninitiated, they are like food for the brain, known to vastly improve cognitive function, magnify attention, maximize concentration levels, and skyrocket creativity. When taken daily, nootropics provide the perfect balance of extreme focus and productivity at a cost-effective price.

In the context of body enhancement foods, nootropics are still a relatively novel concept but the trend has caught on fast. More students, entrepreneurs, and everyday workers are relying on nootropics to maximize performance at work. By comparison, prescription drugs often come with nasty side effects that nootropics are virtually free of (depending on the ingredients used and choice of brand).

The best blends on the market are loaded in efficacious dosages of ingredients such as coleus forskohlii root, theobromine, phosphatidylserine, huperzine A, L-theanine, and taurine. Manufacturers do an admirable job of packing these ingredients together into small, bite-sized capsules.

While there's nothing stopping you from jotting down this list of ingredients and rushing down to the nearest grocery store to stock up on reserves – the sheer effort needed to prepare efficacious DIY blends at home is simply not worth the time (and money). Nootropics provide the perfect intersection of results and benefits, with the least side effects, at the most cost-effective price possible.

Are there any side effects of using nootropics?

Traditional prescription drugs that promise the same level of cognitive improvement as nootropics can cause an array of negative side effects associated with long-term use. Nootropics, on the other hand, are safe and have virtually no side effects when used responsibly and can have beneficial neuroprotective benefits that could improve a person's longevity.

If used in a responsible and educated way, nootropics can provide benefits

rivaling that of ‘smart drugs’ without any of the terrible side effects.

That being said, you should take some time to read through the label and understand what you are getting yourself into. The choice of ingredients and blend used could have an impact on your results. Every ingredient has a different mechanism of action and your brain may respond differently than someone else’s.

Let us Dive into some of the Potential Side Effects of Nootropics:

May Alter Brain Chemistry (temporarily or permanently)

Nootropics affect how the brain works by influencing cerebral circulation, hormone levels, and neurotransmitters, among others. Some blends may even affect the DNA, cell membranes, and mitochondria. Others can fight free radicals, which are unstable molecules that contribute to a long list of chronic health problems. This frequent alteration of brain chemistry could expand or shrink specific areas of the brain, changing how your mind works while you are on the nootropics and even after you discontinue using it.

Potential for Addiction

People using nootropics complain that extended use makes them dependent on the pills. There’s also growing anecdotal evidence which suggests that once users stop taking the pills, their cognitive function may decline. But this is still very much anecdotal and we don’t have peer-reviewed studies claiming such a side effect.

There is No Regulation

There is no regulatory body that governs nootropics. This means it is upon you to do the research on which supplier to buy from. Get a detailed breakdown of the product’s ingredients, how it is manufactured, and their quality assurance practices. Make sure you buy your stack from a verified dealer to ensure you get a safe product.

There is No One-Size-Fits-All Blend

Nootropics cover a wide number of functions including improving motivation, creativity, attention, and focus. You are very unlikely to find a nootropic that does everything, which means you will have to find supplemental nootropics that support it.

Tolerance

As mentioned above, every person's brain is different and may build up a tolerance to certain ingredients in the nootropics. If that happens, you may have to increase dosages to get the same level of effect.

As a rule, you should only buy clean nootropics supplements, that is, they should be free of preservatives, GMO, gluten, additives, caffeine, and artificial colors. The capsules themselves should be clean.

What is the Difference Between "Smart Drugs" and Nootropics?

Most people are new to the idea of nootropics, and make one very big mistake: they do not know the difference between smart drugs and nootropics. They use the terms interchangeably, which is extremely dangerous.

Here is an important distinction: nootropics can improve your cognitive function and mood without harming the brain, but smart drugs can harm your brain.

Nootropics and smart drugs are polar opposites when it comes to the mechanism they use to improve brain functioning.

Smart Drugs

Adderall, Vyvanse, Biphentin, Mydayis, Ritalin, Concerta, etc., are all performance-enhancing, stimulant drugs, under the class of amphetamines, oftentimes recognized as an effective treatment of attention deficit disorder (ADD).

I have been diagnosed with this exact disorder and chose to test out different medications while monitoring its impact on my calisthenic performance.

This specific class of mental disorders affects children and teens but often will persist well into adulthood as it did for me. It is generally represented with symptoms such as experiencing trouble concentrating, staying still, or focusing. The affected individual often rushes through tasks, engages in impulsive decisions and lacks focus due to outside distractions, most noticeably in children aged 6-12. The pressure of today's advanced society, the waves of new electronics, the impossible expectations and obstacles a

person is expected to go through, and the never stopping agitations of everyday life has raised a large population of people suffering from ADD and the number of children affected has never been higher.

If you're on amphetamines, then I highly recommend boosting their results with physical activity. I thoroughly enjoy doing physical activity as a past time, thanks to my passion for calisthenics. A question often studied by neuroscientists worldwide is as to how drugs from this category interact in the nervous system when paired with athleticism. How exactly do these chemicals work hand in hand with the ones produced throughout a workout? More importantly, what are its effects on the overall performances of athletes?

My journey with amphetamines was rather tumultuous and I felt stressed out at the idea of possibly developing a dependence to it. My doctor prescribed me Adderall, a favorite and popular amphetamine. Its effects were powerful; in a way I had never experienced before. My heart rate went up so high that you could hear it beating, my brain cleared itself entirely and a state of hyper-focus took over me. The downside: insomnia.

The night after trying this medicine for the first time, I was unable to clear my mind and I lay awake in bed for hours until the morning birds sang outside in the cold morning. I went on to try Vyvanse 30mg. Others mentioned a loss of appetite, I however did not suffer from any of these symptoms. I lay restfully at night, could keep a strong focus, and felt relieved of stress. I felt energized with my daily workout routine, my brain felt less scattered than usual. However, when I really started breaking the cycle of stress, pill or no pill, I felt the way that I always did during an intense workout: free, focused, and euphoric.

So how exactly do stimulants of this category work? Well, they rapidly and efficiently make their way into the central nervous system by helping neuronal connections boost brain activity, enhancing alertness and focus, and by giving oneself a feeling of wellbeing and mindfulness. It energizes the nerves and brain connections, making it a useful and effective treatment for ADD as well as for narcolepsy. The chemicals contained inside the capsules facilitate the role of our neurotransmitters. Neurotransmitters are chemical messengers in the body whose job is to transmit signals from nerve cells to specific cells throughout the body. Amphetamines distinctively work inside

of three key neurotransmitters residing in the nervous system: dopamine, serotonin, and noradrenaline. Dopamine is the most affected neurotransmitter, its job consists of regulating feelings of pleasure, rewarming, and enjoyment. Serotonin affects anger, appetite, and overall mood, proven to decrease anxiety, and improves the mood of the individual. It is often released during physical activity. Ultimately noradrenaline is the body's fight or flight inhibitor. When a stimulant in the amphetamine is used to treat deficits in these neurotransmitters, it reacts with them to restore the original balance residing between neuronal connections and can help manage ADD in patients.

The conception that physical activity of any kind causes a positive influence on the management of ADD is not a new idea. It has been proven to remarkably improve attention and focus in both short-term and long-term and goes as far as greatly assisting the management of multiple mental disorders, in conjunction with ADD, anxiety, and depression. This reaction occurs; thanks to the serotonin receptors that physical activity stimulates. It also has the beneficial aspect of stimulating blood flow throughout the body and brain. Furthermore, it is proven to improve blood vessel circulation and even brain structure, aiding in concentration and thinking tasks.

The human body responds in diverse ways throughout a period of physical and stimulating exercises. Physical exercises begin with the basic idea of muscle activity. Different exercises stimulate different muscle groups for different reasons. When the body moves and adapts to each movement, energy is needed to generate a high amount of force. Breathing allows one to hoard up the energy required to produce force. As a result, the heart thumps harder, enhancing blood circulation to all parts of the body including the brain. This thorough process of muscle activity and energy consumption stimulates the release of serotonin throughout the body.

In the long-term, this can tremendously affect the mood and other aspects of an individual. Amphetamines are capable of working hand in hand with this process. Not only does it help the release and the operation of the serotonin neurotransmitter, but it aids improves focus and motivation needed to complete physical activity. It is worth noting that exercise, just like stimulants, also seems to release not only serotonin, but also dopamine and noradrenaline. This may be the reason why we feel satisfied and happy during or after a good workout. It is therefore noticeable that amphetamines

and physical activity seem to have similar benefits, from keeping the person on focused and productive, to fostering a feeling of wellbeing and contentment.

Athletes appear to have a similar opinion of stimulants and their benefits. Today, Adderall is widely known as the drug of choice for athletes and students alike. Thanks to its energizing and focus on enhancing capabilities. Focus is required in both the above-mentioned roles and the extra boost is definitely helpful in sports and studying alike. The power of these stimulants is very potent and efficient at improving focus, attention, speed, strength, and may possibly improve hand and eye coordination. It is now virtually banned in most competitions around the world. Powerful drugs of this category are capable of exceptionally enhancing the performance of athletes and students alike without creating negative side effects, making them an ideal and accessible focus-inducing stimulant.

Having experienced the power of amphetamines, I am unable to deny their benefits. They are prescribed for a reason and I can definitely say, that when it came down to my business, I felt ready, almost eager to work without any kind of distractions. However, in correlation with my calisthenics, I felt like I was simply better off without it, that I would rather spend my energy and promote better focus by exercising without the risk of becoming dependent on medicinal drugs. This does not mean I would stop taking my medication, I function much better with it and it has become even more necessary for me. However, when it comes down to exercise I will always prefer to exercise harder than last time, spend all my energy breaking a sweat, then sit down and get to work, rather than taking a pill to derive the same effects.

Sympathetic Nervous System Stimulation

When I was approached by the company to test the product, I thought to myself, “that’s a very interesting product!” No more pre-workout drinks, no more espresso, and chocolate before a workout! I like the idea…

Once applied on your neck, these patches require only five minutes of activation**. You start to right away** feel shiver-like sensations all over the skin, and some strange chills growing all around the neck.

Every 10 or 15 seconds there is a high pulse that really gives off a bizarre

sensation, not unpleasant at all, but surprising.

The intriguing part is that you feel the neck muscle - covering the sympathetic nervous system in tension – contract on each impulse. After about a minute has passed, I must admit that my brain seems to be very calm. I can tell that my cortex is activated by the fact that my state of alertness is higher than before.

I feel more energy and greater focus. That's when I turn the music on and begin my workout routine.

After an hour has passed, my focus is still surprisingly high, my energy stays at a decent level. However, I can feel the difference: the lack of nitric oxide and creatinine. The kind of explosiveness going through my veins. Of course, unless you eat fish (creatinine) and greens (nitric oxide) in the morning, you can only get these kinds of chemicals coursing through your body if you consume a chemical potion such as a pre-workout drink.

I felt no crash or fatigue, not more than what's usual one after a two-hour workout. The good thing is that because I'm no longer taking supplements or pre-workout drinks, my appetite is wide open for a healthy meal, instead of my stomach feeling like it is going for a backflip.

These patches use stimulation programs to enhance the sympathetic nervous system (SNS) activity.

They use no chemical agents and only 5 minutes of electrical stimulation! The nerve branches located behind the ear are stimulated and your sympathetic nervous system (SNS) is triggered for activity.

The 5 minutes of neuro-stimulation or neuro-priming are very comfortable, you feel pleasurable light tingling vibrations behind your ear. Reminded me of the shivers experienced during a first kiss!

The Neuroscience Backup:

From my research, this Bio-hack is a ZERO-RISK neuro-stimulation technology. By targeting the greater auricular nerve, it stimulates your nervous system and enhances SNS activity.

At the end of the day, it looks to me that this neurohack is extremely safe because it delivers a small, controlled dose of electrical current locally to

specifically stimulate your sympathetic nervous system.

In my opinion, this kind of product will always be safer and healthier than any energy drinks or supplements.

Advice on Biohacking Techniques.

Before you start Biohacking, and no matter what technique you chose, keep in mind what Johns Hopkins geriatrician, Dr. Alicia Arbaje hears from her patients about exercising: “can’t do, way too old, too sick, too much pain, don’t have the time.”

I choose to believe that me and the readers who’ve made it this far in the book will never say this, not after we’ve just gone through an entire novel on biohacking! Mindset is everything.

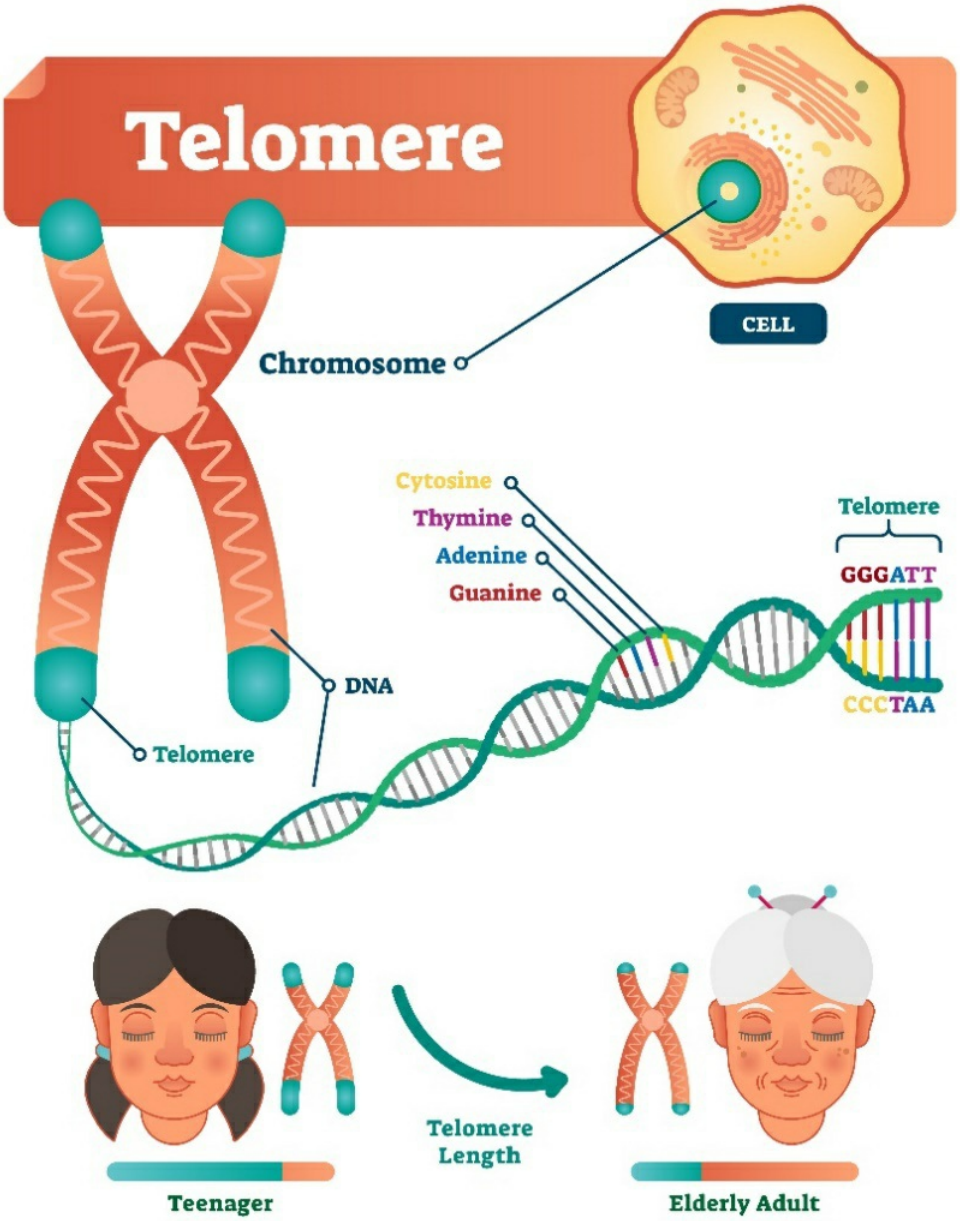
Chapter 11: The Relationship Between Biological Aging and Telomeres

Have you ever heard about Telomeres? I

Our cellular age is apparently based on the length of our telomeres.

Researchers are still trying to understand the inherent human aging process and how to stop it, if that is even possible.

There’s no definitive anti-aging solution out there, and likely won’t be developed in the near future. Our body is rigged from the get-go to deteriorate with time. How rapidly that happens depends on our interaction with the outside environment and lifestyle choices that we make.



Of course, there's a patchwork of theories that scientists are still trying to wrap their heads around: could it be because of a glucose build up? Is oxidative stress to blame? Or are our cells just fated to go through a biological timetable irrespective of outside factors and there's nothing we can do about it?

There is a growing consensus that the aging process may have something to do with telomere length.

Telomeres, for the uninitiated, are tiny repetitive non-coding DNA sequences at the ends of our chromosomes. They act as 'caps' that protect the

chromosomes from fraying, wear and tear, or just sticking to each other. However, whenever our DNA makes a copy of itself, the process takes a toll on the telomeres and they decrease in length.

When telomeres reach a critical length, the cell stops dividing or dies and this manifests as accelerated aging.

The Shoelace Metaphor for Telomeres

One very popular metaphor commonly used to describe telomeres is the protective plastic tips at the end of shoelaces.

But the research is still in its early cycle and scientists seem to be contradicting each other.

Some experts cringe at the shoelace metaphor because they don't believe that it's a realistic representation of how telomeres work. Telomeres almost never get used up, and the chromosomes never unravel, because cellular dysfunction reaches a tipping point long before that ever happens, argues Dr. Michael Fossel, who co-authored the popular book '*The Immortality Edge'*.

In normal aging, your Telomeres will never get 'knocked out'. The truth is, our chromosomes can remain in pretty good shape even if we live to be over a 100. The only time they 'unravel' is during decomposition.

What we do know, however, is that our telomeres play a major role in protecting the DNA. Without telomeres, the genetic information in our cells would disappear each time a cell divides.

As a general rule, the absolute length of the telomere does not matter *much*. But your body works best if the telomeres have a certain length. If the telomeres are too short or too long, it's considered to be bad because the telomere length alters expressions of genes.

The research is still on-going and to pin your hopes on theories that continue to stir up heated debates is naïve, to say the least.

The key question, then, is to determine if there is a relationship between lifestyle factors and the aging process – because that's what we're here to do right?

So How Do We Slow Down the Aging Process Again?

The unanimous answer to this question almost always comes down to exercising, nutrition, and optimizing (aka biohacking) our bodies and minds.

Scientists at King's College London studied the profiles of athletes who set world records in swimming, cycling, and athletics. Their profiles were drawn up as curves that related the aging process to their physiological performance over a period of time.

In the case of highly trained individuals, the shape of their curve was physiologically optimized for their age. In average humans with a more sedentary lifestyle, the curve is on a rapidly declining trajectory. But this can be easily prevented with exercise and lifestyle tweaks.

Now, I can understand that most individuals almost never have enough time in the day to train as vigorously as world-class athletes. But, the research goes on to hypothesize, *with reasonable skepticism*, that all individuals who engage in *sufficient* (keyword: 'being sufficient') physical exercise should be able to control their aging process.

Exercise has been shown to manipulate telomere length, after all – although research is still ongoing.

Exercising and Biohacking *Can* Manipulate Telomeres

Elizabeth Blackburn, a Nobel Laureate and biologist, claims in her new book that it is possible to make simple lifestyle tweaks to manipulate telomeres.

Blackburn argues, that while telomere length is not a good indicator of when we die, they are a reasonably good indicator of how long we'll stay healthy and when we get diseases. Because, at a certain stage when our telomeres are reasonably worn out, the aging tissue becomes vulnerable to an onset of diseases that begin to take root.

We also know that a single disease creates ripe conditions for multi-morbidities, meaning, the onslaught of co-occurring diseases. For example, people who have diabetes often also have heart disease.

Blackburn identified many health behaviors that she says are linked with telomere health, these include the following:

- Body fat (which you can effectively control with calisthenics)
- Exposure to chemicals like cadmium and lead

- Levels of antioxidants in our blood (which depends on our diet)
- Our response to stressful situations in life
- Anger management in each individual
- Social support systems, especially as we age

At every stage in our life, we will always have a modicum of control over the aging process. Improving our biological markers (including telomere length) requires making a few changes (*or indeed radical changes*) to our lifestyle choices.

Missed a day at the gym? Cheated on your diet one too many times? Or sat on your computer for extended periods of time?

Every decision we make, consciously or subconsciously, shifts our biology towards cell aging.

How we respond to stress also plays a role in the aging process. The trick is to identify and anticipate your trigger moments and make simple tweaks to increase your stress resilience. Maybe going to work or being stuck in traffic initiates a stress response. There are things we can do right before or during these ‘trigger’ moments to change our response to stress and improve our health.

I suggest choosing a type of mind-body exercise that suits you and your schedule. These days, there’s a ton of exercises, supplements, and meditation techniques to choose from.

There is a great inter-individual variability on the biological markers of health, due to differences in exposure to chemicals, environmental stressors, and emotional support systems. Each of us has the opportunity to personalize our own telomere ‘protection’ program.

Chapter 12: Conclusion

Throughout the course of this novel, we've looked at several basic principles of neurosciences, what neuroplasticity has to do with calisthenics, how our body works, what can affect it and what role our mindset can play in our lives.

Let me sum this up by giving you a brief low-down on what you can do to protect your telomeres to live longer (and healthier):

- Exercise (calisthenics are extremely effective at doing this)
- Maintain a healthy weight
- Meditate more to deal with stress
- Load up on healthy foods
- Limit exposure to toxic chemicals

And by adding a glass of wine per day (to reduce stress), cultivating a social life, and of course using some mitochondrial boosters such as CoQ10, PQQ, glutathione, rapamycin/metformin, MitoQ, Astragalus, Vitamin D/K2, fish oil, C60, SkQs, multivitamin, and multi-mineral supplements with magnesium, you will most probably **Hijack Your Body Clock**! …

Until science brings us some other solutions!

As a matter of fact, researchers have found a way to reset the body clock by using light to stimulate neurons in the region called Suprachiasmatic nucleus (SCN), a bundle of brain cells suspected to play a major role in our "master clock''. It triggers phosphate to combine with a brain protein called eIF4E, this process is known as phosphorylation. Apparently, when these proteins are overproduced, the clock resets and precise timekeeping is facilitated. It is like having a RESET switch to hijack your body clock!

However, this will require genetic modification, not a cup of tea for us simple humans, or cyborg wannabes…. for now anyway.

I'm not expecting you to memorize the contents of this book, the goal was simply to make you realize that the power and ability to do something begins and ends in your mind, and achieving our maximum potential is then related

to the subconscious mind and to our brain.

Visualizing what you want to see for yourself and deliberately moving things in that direction is the most effective method: **Biohacking your mental mindset and telling it what to do.**

The way you think about yourself, others and the world has a big influence on how you perform and accomplish your goals.

Simply speaking, biohacking involves techniques to make sure you will live a better, healthier life. Maximizing physical and mental wellness will improve and extend your life while improving your health.

Nutrition, sport, supplements, but moreover, sleep, and exercise will contribute to biohacking your body clock

You will not be required to install a new electronic board, a chip, or a flash drive into your body; not even manipulate your genes code to control your biological capabilities.

Everyone can implement biohacking strategies.

None of the biohacks I explained in this book are for superhuman warriors or super-rich billionaires.

Biohacking is just sleep & food.

Here are a few important things to remember:

-Cold showers are based on ancestral cultures and customs, which means they are not harmful and won't endanger your life (as long as you take them responsibly).

-Using technology will not damage your brain. Nowadays technology helps us monitor our health and optimize our performance. Having a smartwatch or using a fitness tracker is Biohacking!

Looking at the future of biohacking, one day we'll be able to fully use our genetic information to not only treat but to prevent most diseases.

Health Improvement is Biohacking.

Biohacking is just a buzzword that means making modifications to our lifestyle to improve health.

At the end of the day, we should all do something to improve our life, health and be a better version of ourselves.

Using biohacking techniques, working consciously and diligently with your neuroplasticity, learning something new every day, exercising properly, playing safe with the circadian rhythm, and making sure not to mess up with protein expression – you know, just having healthy habits…

Once your mindset is fully aligned with your body, you'll be ready to become a real life, undefeated cyborg!