'David has done a stellar job in gathering the science and philosophy behind a range of seemingly woo-woo subjects.'

Vex King, author of *Good Vibes, Good Life*

Why Woo-Woo Works

The Surprising Science Behind Meditation, Reiki, Crystals, and Other Alternative Practices

David R. Hamilton Ph.D.

Praise for *Why Woo-Woo Works*

'We sometimes call things "woo-woo" not because we're experts on those subjects, but because we're not experts and we haven't dived into all the available science and research. In this book, David has done a stellar job in gathering the science and philosophy behind a range of seemingly woo-woo subjects and shown that they are, in fact, "true-woo."'

Vex King, #1 *Sunday Times* best-selling author of *Good Vibes, Good Life*

'Dr. David Hamilton is one of the leading experts in the field of the mind-body connection. As a scientist, he bridges real science with human potential in order to prove to you how powerful you really are. This book will change your mind.'

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'Science has historically looked askance when faced with traditional healing systems. We now realize that alternative therapies and Western methods can be used together to reach a state of lasting wellness.'

Deepak Chopra

'Why Woo-Woo Works *is one of the clearest and most accurate expositions of alternative mind-body practices that I've had the pleasure to read. Hamilton also offers explanations that help to demystify the woo-woo taboo. A delightful and inspiring read.'*

Dean Radin, Ph.D., Chief Scientist, Institute of Noetic Sciences

'David is an incredibly inspirational man who I'm proud to call a friend. His work has changed the lives of many and he stands out because he always strives to explore and answer the difficult questions using evidence and science, which in a world full of misinformation, is needed. A truly wonderful and fascinating book. A must-read!'

Dr. Punam Krishan, GP, writer, and broadcaster

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Introduction

The Oxford University Press's definition of woo-woo is 'Unconventional beliefs regarded as having little or no scientific basis, especially those relating to spirituality, mysticism, or alternative medicine.'[1] The term is believed to have been coined in the 1980s, possibly in imitation of the wailing sound associated with ghosts and the supernatural.

Many complementary therapies, healing modalities, treatments, and other practices, theories, and beliefs are often referred to as woo-woo, but this is because they're not widely understood and most people are unaware that in some instances, they've a sound basis in science.

In the late 1990s, after completing a Ph.D. in organic chemistry, I worked in the pharmaceutical industry, where I helped develop drugs for cardiovascular disease and cancer. Over time, I became fascinated by the fact that in clinical trials, the participants who were given a placebo (a dummy drug) instead of the real drug would very often see an improvement in their condition.

The prevailing belief among scientists was that this phenomenon, which is known as the placebo effect, was some kind of illusion – it wasn't real. My suggestion to colleagues that there might in fact be an effect of the mind on the body – a supposed 'mind–body connection' – was dismissed as quackery.

And yet, even back then, research had shown that expectation (you *will* get better) and belief actually cause biochemical changes in the brain, and this underpins *how* and *why* the placebo effect works. The theory that the mind has an impact on the body wasn't quackery after all. It was supported by scientific evidence. My colleagues and I were just unaware of it at the time.

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This is often the case. Science spans a very broad region of knowledge, and it's next to impossible to know everything about every scientific field. Most of us know a lot about one or two things or a small amount about a lot of things. Applying the label woo-woo or pseudoscience to certain beliefs, theories, or practices often betrays our lack of awareness of the available thought or research on them – whether it's from philosophy, psychology, biology, physics, chemistry, geology, cosmology, or other disciplines.

While walking in a park with a friend one day I pointed to a cloud in the sky and told him that it probably weighed around 100 tons (90 tonnes). He laughed – not in an unfriendly way, but just at the preposterous notion that we can establish the weight of a cloud. For him, it conjured up an image of a giant set of kitchen scales. Clearly, it's impossible to know such a thing.

But that's not the case. A cloud is made of water droplets, and to ascertain its weight we can simply fly a drone through it containing

a cup of known width and collect water droplets en route. First, the length of the cloud is measured by calculating the time it takes for the drone to fly through it at a given speed, and from there, it's relatively easy to calculate, from the amount of water droplets collected in the cup and the approximate size of the cloud, roughly how much the cloud weighs.

I use this cloud weight example to demonstrate that we often question the veracity of particular theories or ideas simply because we know very little about them, or sometimes even because we've heard other people refer to them as unscientific and it would seem sensible to adopt the same viewpoint. We're social creatures, after all.

In this book I take a number of subjects that are typically denounced as woo-woo and show that there's quite a lot of scientific evidence for them, much of it largely unknown other than to those working in the relevant field.

The first part explores the placebo effect, visualization, meditation, and the link between suppressed emotions and disease. These are at what we might call the 'lower end' of woo-woo in that at least some people are aware of the scientific evidence that exists for them. I share that evidence with you, and also explain exactly *how* these phenomena and practices work.

I then move on to the field of complementary medicine, presenting an overview of the many research studies that show reiki is an effective therapy for managing pain, depression, and anxiety, and sharing the science behind this 'energy healing' technique. In the chapter on crystals, I draw on Buddhist philosophy, the science of color psychology, and even the diamagnetic and paramagnetic properties of these mineral stones to explain precisely *how* they work for us.

In the latter part of the book I delve into telepathy, distant healing, and prayer. Although these phenomena are often dismissed as pseudoscience, there is in fact a large amount of statistical evidence to support them, although it's not widely known to the general public. As we'll discuss, one of the key factors in the way they work is emotional connection: EEG and MRI studies show that the more emotionally connected two people are, the stronger any effects tend to be.

*****

My interest in esoteric topics began when I was a child. My mum developed postpartum (postnatal) depression in 1976, following the birth of the youngest of my three sisters. The condition wasn't well understood at that time – 'Give yourself a shake,' was one doctor's recommendation.

She was prescribed antidepressants and antianxiety medication, but the thing that worked best for her was meditation. It didn't cure her, but it helped her get to sleep, enabled her to better manage her state, and supported her mind and emotions through difficult times.

My mum's practice was listening to a guided meditation tape every night before bed, and she continued with it for years because it worked so well. The tape featured relaxing music and the sounds of nature, which, as we'll explore in the book, are now known to have a direct impact on the human autonomic nervous system.

Meditation has long been practiced in cultures around the world and yet it was considered pseudoscience in the West until fairly recently; in some places, that's still the case. However, today we know with scientific certainty that meditation causes beneficial

structural changes in the brain that help us with our mental health as well as with concentration, memory, and self-esteem – it's even been shown to slow the rate of biological aging.

While I was growing up, my mum and I talked often about the power of the mind, and this shared interest, and my observation that it had helped her condition, led to my fascination with the placebo effect when I worked in the pharmaceutical industry.

In the years since, and even today, mum and I have had many more conversations about these and other 'woo-woo' subjects – many of which are covered in this book – and eventually these catalyzed a career change for me. I left the pharmaceutical industry and went on to write several books exploring the mind–body connection, self-esteem, and even the impact of kindness on mental and physical health.

In this book, I present the science behind woo-woo and reveal how and why it really works. I hope you enjoy it.

Dr. David R. Hamilton
March, 2021

CHAPTER 1

Mind Over Matter

'They're *not* getting better. They just *think* they're getting better.' This was a typical sentiment expressed by my pharmaceutical company colleagues when I asked for their opinion of the placebo effect, a phenomenon that was particularly relevant to our work given that the drugs we were developing would be tested in clinical trials.

This view was always offered amicably, but it underlined the assumption, held for decades, that the placebo effect was 'all in the mind.' If a patient who had been given a placebo in a drugs trial got better, it was written off as part of the natural course of their illness – it would have happened anyway.

A placebo is an inactive (or dummy) treatment, in the form of a pill, injection, or device, that's administered in clinical trials to test the real drug or treatment against a control (comparison). As such, a placebo isn't designed to have any therapeutic effects on the patients who take it. However, in reality, it often does – and when this happens it's because the patients believe the placebo is the real drug or treatment: it's their *belief* that does the work.

Belief Alters Biology

The placebo effect might appear to be an illusion, but science has shown that belief itself has real biological effects. Admittedly, this does sound a bit woo-woo; however, woo-woo is only woo-woo in our mind until we know the science, and then it's 'true woo.'

> ***In fact, there's no question that belief causes chemical changes in the brain, and these changes are dependent on* what *a person believes.***

For example, patients can believe opposite things about the same placebo and get opposite effects from it. If a patient believes that a pill (if it's a placebo) will *reduce* pain, it *will* usually reduce pain. Yet if they had believed it would *cause* pain it would have done that instead. In the former case, the belief causes the production of the brain's natural versions of morphine.

In the USA, scientists at the University of California at San Francisco showed that endogenous opioids, the brain's own morphine, were responsible for the painkilling effects of placebos used during dental surgery.[1] But crucially, the endogenous opioids are produced in response to a person's belief or expectation that the pain will go away. If a patient believes that a pill (if it's a placebo) will cause pain, the belief *blocks* these natural opioids in the brain, essentially elevating pain.[2]

A belief that a pill (if it's a placebo) will help us relax will bring about a calming effect, yet if we believe that it's a stimulant, we'll feel agitated and our heart rate and blood pressure will rise – even though, in both cases, the pill is a dummy.

When a group of athletes were given substances that they believed would increase their strength and endurance, they did indeed gain strength and endurance. But the substances were placebos. Luckily, these 'performance-enhancing placebos' (PEPs) couldn't get them banned from competition because they were, well, dummies. Perhaps many athletes just need a PEP talk.[3]

And in research conducted by scientists in the departments of psychiatry and medicine at the State University of New York, 40 patients with either asthma, emphysema, or restrictive lung disease were given an inhaler containing a nebulized saline placebo but were told that it contained allergens that would restrict their airways.[4] Before long, 19 of the patients reacted with considerable constriction of their airways. Twelve, in fact, had a full asthma attack. When they were given a different inhaler and told it would relieve their symptoms, even though it was also a saline placebo, it did relieve their symptoms.

Therefore, that one placebo inhaler either reduced or created bronchospasm in asthma sufferers, depending on what the patients *believed* it would do. One person even developed symptoms of hay fever when they were told that the inhaler also contained pollen, and those symptoms were again relieved when they were given another saline inhaler that they believed would do that.

Studying the Placebo Effect

It's also possible to use color as a placebo because of what it represents to us. In the USA, in a unique way of teaching medical students about the placebo effect, University of Cincinnati medical professors gave a class of students pink and blue placebo pills and told them that they were stimulants and sedatives.[5] It

was found that the blue pills were 66 percent effective as sedatives, compared with 26 percent for the pink pills.

In other words, blue placebos were around two and a half times better than pink ones for helping people to relax. This is because for most people, blue is a calming color, and this informs some of what we believe it will do. The researchers also found that giving the students two placebos rather than one was more effective.

And as strange as it sounds, although perhaps not to parents, for children, a plaster illustrated with a colorful cartoon or a magical character reduces pain and heals a cut faster than a plain plaster.[6]

Where we live also affects the power of a placebo. In a US study of migraine treatments, placebo injections were found to be 1.5 times more powerful than placebo pills, while a European trial found that placebo pills were about 10 percent more effective than placebo injections.[7]

The reason for the difference lies in our cultural language. Americans tend to speak of 'getting a shot,' so they're more likely to believe in injections, whereas Europeans talk of 'popping pills' (or at least they do in the UK), so they place their faith in pills.

In a similar way, in trials of Tagamet, an anti-ulcer drug popular in the 1970s and 80s, the placebo was 59 percent effective in France but the drug itself was 60 percent effective in Brazil.[8] Advertising budgets for drugs are higher in Western Europe than in South America, and more advertising spending creates a stronger perception of the power of a drug, but it has the same effect on the placebo.

Perception Matters

The way a placebo is packaged also makes a difference to its power. In a study at Keele University in the UK, 835 women were given one of four different pills for headache.[9] One group received a well-known branded aspirin tablet, while a second group received an aspirin tablet simply labeled 'analgesic,' which was typical of a cheaper mass-market brand. A third group received a branded placebo labeled 'aspirin,' while a fourth group took a basic unbranded placebo that was labeled 'analgesic.'

It transpired that the branded aspirin worked better than the unbranded one, and the main difference was in the appearance of the packaging; however, amazingly, the branded placebo worked better than the unbranded placebo – even though they were both made of sugar.

This explains why so many people swear that branded painkillers such as Nurofen (Advil) work better for them than generic packs of ibuprofen, even though they contain the same drug. There's a significant price difference and Nurofen has more expensive-looking packaging, so people expect more from it. Drugs are designed to carry out a biological function, but as well as the impact of a drug on the body, the *mind* also has an impact.

You might now see why for most people, an expensive drug works better than a cheaper one. The same might also be true of a more expensive therapist. But what really makes both better – the drug and the therapist – is the person's mind.

Perception is important, even when we're not consciously aware of the contents of our mind.

According to a paper published in *Advances in Psychiatric Treatment*, this might even enhance the power of the drug Viagra, which is used to treat erectile dysfunction, beyond its basic pharmacological effect.[10] The name 'Viagra' sounds similar to the words 'vigor' and 'Niagara,' and given that Niagara Falls is a *force of nature*, this might create a perception of vigorousness and natural power. I wonder if the drug would work so well if it was called 'Softy'!

The Power of Positive Consultation

In some cases, the mind can *enhance* the effects of a drug – depending on what the patient believes it's supposed to do, or on their perception of the doctor who prescribed it – and in other cases it can *suppress* the effects, in accordance with what they believe.

We know this because some of the variation in the placebo effect simply comes down to communication between medical staff and patients. For relatively common ailments, a doctor who shows confidence or optimism about the patient's recovery is much more likely to see them get better than one who is unsure or pessimistic.

For example, based on studies that show that no firm diagnosis is made for about 40–60 percent of patients visiting general practice surgeries (offices), a University of Southampton study in the UK investigated the consequences of different styles of consultation in patients in this category.

Publishing in the *British Medical Journal*, they compared the outcomes of 200 patients, half of whom received a consultation that was conducted in a 'positive' manner while the other half received a consultation that was conducted in a 'non-positive' manner.[11]

In the 'positive' consultations, the patients were given a firm diagnosis and confidently told that they would recover in a few days' time. Sometimes a prescription was given and the doctor assured the patient that it would make them better; at other times, no prescription was given and the doctor assured the patient that none was needed.

In the 'non-positive' consultations, the doctor displayed uncertainty, saying, 'I cannot be certain what is the matter with you.' If the doctor was offering a treatment, they would add, 'I'm not sure that the treatment I'm going to give you will have an effect.' If no treatment was to be given, the doctor would instead add, 'and therefore I will give you no treatment.'

The prescription given for those patients being treated was 3 mg of vitamin B1, marked 'thiamine hydrochloride,' a very low dose that was essentially a placebo. After two weeks, 64 percent of the patients who had received the positive consultation were better, compared with only 39 percent of the patients who had recovered after receiving a non-positive consultation. And it didn't matter whether they were treated or not. The difference in how many patients recovered, almost double, was down to the way the doctor communicated with the patient.

Why does belief cause these effects? Painkilling placebos work because the person *expects* to feel a reduction in pain. This expectation causes their brain to produce its own natural painkillers, which then reduce the pain.

Studies at the Neurodegenerative Disorders Center at the University of British Columbia in Canada have shown that believing a placebo is an anti-Parkinson's drug causes the brain to produce the neurotransmitter dopamine.[12] Here, and in the case

of painkilling effects, belief mobilizes the brain's natural resources to meet the person's expectations. That is, a belief about what's supposed to happen instructs the brain to produce what it needs to produce to deliver that result.

Of course, this applies only within reason. Belief that a placebo is a chemotherapy drug doesn't make the brain produce its own chemotherapy drug, and there could never be an ethical case to experiment with this. However, some documented spontaneous remissions in patients may have occurred because belief, or faith, mobilized the immune system.

Can We Harness the Placebo Effect?

In the department of cardiovascular surgery at the Heart Center of the University of Marburg in Germany, 124 patients scheduled for coronary artery bypass graft surgery were randomly distributed into three groups.

The first was the 'Expect' group, where the focus was on optimizing patients' positive expectations of life after surgery, such as engaging in activities; the second was the 'Support' group, where patients received emotional support; and the third was the 'Standard medical care' group, where patients received the usual treatment.[13]

Patients were followed for six months after their surgery. Those in the 'Expect' group had much greater quality of life and subjective working ability than those in the other two groups. Support was helpful too, but expecting that things would go well had by far the greatest effect. When doctors give hope to patients, helping them to *expect* to get better, they *do* get better faster.

Placebo-Controlled Dose Reduction

An exciting line of research into harnessing the placebo effect is placebo-controlled dose reduction (PCDR), where scientists give a drug for a few days and then, without the patients' knowledge, swap it for a placebo. The more times the patients receive the drug, the more strongly they associate relief of symptoms with receiving the drug, and so the stronger is the effect of the placebo when the swap is made. In this way, the dose of a drug can be reduced and replaced by a placebo.

Fabrizio Benedetti, Professor of Physiology and Neuroscience at the University of Turin Medical School in Italy, powerfully demonstrated this effect with a study involving Parkinson's disease patients.[14]

The patients were split into several groups. All but one group received a full dose of the anti-Parkinson's drug apomorphine on day 1 of the study, and Benedetti measured their clinical response as a reduction in tremors and muscle stiffness and also in the degree of activation of individual neurons in the brain region known to be affected by the condition. He gave the other group a placebo injection (saline) instead, and there was no clinical effect whatsoever.

Over the next few days, Benedetti swapped the drug for the placebo in different groups. One group who got the drug on day 1 received the placebo on day 2. Another group received the drug for two days and it was swapped for the placebo on the third day, and yet another group received the drug for three days before it was swapped for the placebo on day 4.

Each time a patient received a dose of apomorphine, they had the experience of 'when I receive this injection, my tremors reduce and my muscle stiffness lessens,' and each day, the effect of the placebo became stronger.

On day 5, Benedetti did the drug-placebo swap for the final group, who had received apomorphine on the previous four days. They had built up even more of the experience of 'when I receive this injection, my tremors reduce and my muscle stiffness lessens.'

Amazingly, the strength of the saline placebo matched that of the drug, reducing tremors and muscle stiffness and activating neurons to the same degree. Benedetti reported, 'It should be noted that placebo administration following four apomorphine preconditioning trials induced clinical responses that were as large as those to apomorphine.'

Some patients were initially given a placebo to see if it had any effects, and there were none. Yet, after four days of experience of associating the drug with a change in symptoms, the drug could be phased out and replaced with a placebo. These results weren't just 'all in the mind' because there were measurable changes in the brain in the striatum – the region that's usually deficient in dopamine in Parkinson's patients.

The same kind of effect seen with placebo-controlled dose reduction has also been demonstrated with the immune system, where a phased swapping of an immunosuppressant drug (cyclosporin A) for a placebo suppressed the immune system.[15] PCDR works because expectation and belief cause physical changes in biochemistry.

The aim of this line of research on the immune system is to help patients receiving organ transplants, or even those with autoimmune conditions such as multiple sclerosis (MS), rheumatoid arthritis, and lupus. Ultimately, if PCDR could be applied to a larger range of medical conditions, it could result in a huge cost saving, allowing funds to be funneled into other areas of healthcare.

PCDR may also reduce the side effects of medication. In one PCDR study, children with ADHD had 50 percent of their drug dose swapped with placebo and there was evidence that they experienced fewer stimulant-related side effects.[16]

The Nocebo Effect

It's sometimes the case that people experience side effects with placebos, when they know what the side effects are. This is known as the nocebo effect. While the word placebo is derived from the Latin for 'I shall please,' the word nocebo comes from 'I shall harm.' It's where the *expectation* of a negative effect produces one.

A randomized controlled trial (RCT) is a clinical trial in which patients are randomly assigned – selected by chance – to receive a drug or placebo, and neither the patient nor the research team knows who receives what. In Greece, a statistical analysis of 21 randomized controlled trials of antidepressants conducted at the neurology department of Athens Naval Hospital and the First Psychiatric Department of Eginition University Hospital found that about 45 percent of patients who received placebos reported the side effects of nausea, headache, and dizziness, which were the expected side effects of the drug itself.[17]

In another statistical study of 56 studies, 74 percent of MS patients experienced side effects after receiving placebos.[18] And in a study conducted by Bayer Pharmaceuticals that examined drug and placebo treatments for patients with angina or diabetes, researchers found that the side effect profile for the placebo was largely the same as that for the drug.[19]

Typically, if a person knows what the side effects of a drug are, they get those side effects when they receive a placebo – *provided* they're unaware that they're taking a placebo. However, if they don't know what the side effects of a drug are, they don't typically get them.

The Expectation of Better

I sometimes refer to the placebo effect as the perception effect. One reason for this is that many people still consider a placebo to be empty – any seeming improvement in the patient who receives one must be a figment of their imagination. As we've discussed, for years, the idea that belief could impact biology was considered woo-woo.

However, we now know with factual certainty that chemical changes occur in the body when a person believes that a placebo is a real drug. With placebo painkillers, people experience less pain. They aren't imagining it – their pain *really is* less, and that's down to the natural painkillers that are produced in their brain because they believe the placebo is a painkiller.

As I mentioned earlier, more expensive-looking placebos are more effective at reducing pain than cheaper-looking ones; the fancier packaging creates the *perception* that the placebo is better, so patients expect more from it.

As a culture, we've agreed on the story that if one thing is more expensive than another, then it must also be *better*. We've heard it many times in our lives and we've also had direct experience of it – most of us tend to get more wear out of a more expensive jacket or pair of shoes, say, than our everyday inexpensive clothing.

So when we pay more for the same medicine or treatment, our expectation of *better* generally makes it so for us. Of course, this applies within reason, and I'm not condoning the use of highly expensive unproven treatments that sometimes cost people their life savings. I'm referring in general to the fact that our beliefs and perception alter our brain and body biochemistry in a direction that confirms what we believe is supposed to happen.

Biology will always follow perception. When perception shifts, so does biology. In one study, for example, volunteers were shown an image of a horrific car accident in which people had sustained serious injuries. There was a massive spike in the volunteers' nervous systems as their bodies reacted with stress to the image.

However, they were then reassured that the image wasn't of a real accident: it was a still from a movie set, and the apparently injured people were actors wearing makeup for the scene. Almost instantaneously, the volunteers' nervous systems calmed. They didn't just feel calmer in their mind – there was a significant physiological effect that followed from their perceptions.

The Power of Our Imagination

To a large extent, the brain doesn't distinguish real from imaginary, and this underpins some aspects of the placebo effect. When you imagine that something is happening, it really

is happening as far as your brain in concerned, and it releases the chemical substances necessary to confirm that what you're imagining is indeed real.

One of my favorite scientific studies is affectionately known as the piano study.[20] In 1995, Alvaro Pascual-Leone, a professor of neurology at Harvard Medical School in the USA, asked a group of volunteers to play a sequence of five notes on a piano every day for five days. Each session involved playing notes for two hours, one note with each finger of the hand, moving up and down a scale of five notes.

While the volunteers did this, a separate group did the same thing, only without a piano. They closed their eyes and *imagined* that they were playing the five notes in this way. This is called kinesthetic imagery, and it's where we re-create movement by vividly imagining how it feels to move.

Each volunteer had a daily brain scan, and at the end of the five days, those who had played the notes on the piano had considerable changes in the brain region connected to their finger muscles; however, the same was true of the volunteers who had imagined playing the notes. In fact, on comparing the scans, it wasn't possible to tell whether a scan came from a person who had played the notes with their fingers or with their mind.

Visualization to Enhance Performance

It was already known at the time of the piano study that athletes could enhance their performance by practicing visualization, but this was the first brain-imaging confirmation of what's actually happening when a person visualizes something. The prevailing belief among sports coaches was that visualization worked by

enhancing an athlete's focus and their motivation to train and practice. Any notion that the brain was actually changing was swiftly dismissed as pseudoscience.

In the mid to late 1990s, I served as a part-time athletics coach and manager of the junior (under 20s) men's team of a large and very successful athletics club in Manchester in the UK. I also competed myself as a long jumper.

One day at a junior athletics event, a PE teacher told me about the time she met Ed Moses, the former 400 meters hurdles men's world record holder and multiple world and Olympic gold medalist. The great American athlete had been in the UK for an international competition and he'd visited her school to speak to the children about sports.

The following day at the meeting, the teacher watched as Moses' fellow athletes warmed up before the race, stretching and striding up and down the track, but she couldn't see him anywhere. She eventually spotted him lying down beside a hurdle, with his eyes closed. She wondered what on earth he was doing, seemingly losing valuable warm-up time.

Shortly before the race, Moses got up, did some stretches and a few sprints, and then went out and won, a good 30 feet (10 meters) clear of the other runners. The teacher had a chance to chat with him afterward and asked him if he'd been doing some kind of relaxation exercise beforehand, or if he'd even been asleep.

Moses explained that he'd been visualizing. He'd imagined the whole race in his mind – from the moment the starting pistol fired to reaching the first hurdle, and the feelings and sensations in his body as he cleared it; then taking exactly 13 strides to the next

hurdle before clearing that too, and so on. He'd pictured himself running the race in the way he wanted to run it.

A few years later, I met the British athlete Sally Gunnell, also a former world and Olympic gold medalist and 400 meters hurdles women's world record holder, at a corporate event at which we were both speaking. Afterward, we chatted about visualization, because Sally had explained to the audience that 70 percent of winning an Olympic gold medal is mental, and that a large amount of her personal practice was visualization.

Like Moses, Gunnell visualized running the whole race, stride for stride, hurdle for hurdle, but with particular focus on the last portion; in a 400 meters hurdles race, this is the stage at which athletes often feel that their legs are as heavy as lead. When she visualized this part of the race, Gunnell would imagine her legs feeling light and moving with ease; she would repetitively visualize running in a relaxed way, even if another athlete appeared to be catching up with her, something that typically causes athletes to tense up.

Gunnell explained that she'd started doing visualization work after finishing a disappointing sixth at the 1990 European Championships. When she won the Olympic 400 meters hurdles title in 1992, and broke the world record at the World Championships the following year, she was reaping great rewards from her mental practice.

Practice Plus Visualization

While I worked in the pharmaceutical industry and coached and competed in athletics on the side, I shared with a few colleagues that I was experimenting with visualization practice. Most were

supportive, but some found it amusing that, as a scientist, I was working with techniques widely regarded as pseudoscience. It was friendly banter, but typical of the assumption at the time.

I continued to practice all the same, but kept it to myself. In a three-month experiment, I practiced visualization almost daily, and I also listened to a Paul McKenna 'Ultimate Athlete' self-hypnosis tape, which helped me to believe in myself. And in an outcome that I found astonishing myself, my long jump personal best improved by almost 3 feet (1 meter). The improvement was significant enough for me to recognize just how effective visualization could be, even in a short time, long before I became aware of the neuroscience research.

Visualization does more than improve an athlete's focus and motivation – it also affects their brain networks and significantly alters the strength and movement range of their muscles.

In multiple studies, scientists have compared the strength of people lifting weights with people *imagining* lifting weights and have found relatively small differences in strength between the 'real' and 'imaginary' groups.

One study by researchers in the department of biomedical engineering at the Lerner Research Institute in Cleveland, USA, for example, compared volunteers flexing a finger several times a day with volunteers imagining flexing the finger, and found that while those who did the real movement increased their finger strength by 53 percent, those who did no movement but just imagined it increased their strength by 35 percent.[21]

Following copious amounts of modern research, it's now well understood that the optimum way to enhance performance in any sport or movement is to combine physical practice with visualization. In order of best first, research shows that physical practice plus visualization is more effective than physical practice alone, which is better than visualization practice alone.

Visualization to Assist Recovery

The aforementioned kind of practice has also helped hundreds of people to recover faster after suffering a stroke. In multiple research studies, stroke patients received either standard physiotherapy or physiotherapy plus visualization, and those who did visualization in addition to their physiotherapy improved to a greater degree and much faster than those who did physiotherapy alone.

For example, in a University of Cincinnati study in the department of physical medicine and rehabilitation, after each physiotherapy session, chronic stroke patients listened to a tape that guided them through visualizations of moving the hand, arm, and shoulder of their impaired side.[22] When tested after six weeks, the patients' arm function was significantly better than that of patients in a control group who did relaxation after physiotherapy.

A large meta-analysis has since referred to visualization as a 'viable intervention' for people recovering from a stroke.[23] And yet 20 years ago, visualization was still considered pseudoscience.

Further analyses suggest that in some stroke patients, visualization even helps repair some damaged brain regions, and in some others the area responsible for movement switches to a new brain location that isn't damaged, permitting neuroplasticity there and a return to more able movements. In one neurological study, for

example, researchers reported that the brains of stroke patients who used visualization had undergone some degree of cortical reorganization as a consequence of their mental practice.[24]

Thinking Kindness

The real versus imaginary phenomenon is much more widespread than in the areas we've discussed so far, though. The brain produces stress hormones regardless of whether we're in a stressful situation or *imagining* a stressful situation. It's the feelings of stress that trigger the release of stress hormones such as adrenaline and cortisol, independently of the situation itself.

For example, two friends are sitting in a car that's stuck in traffic. One feels stressed at the thought of being late for her appointment, while the other accepts the situation: she knows that she can't do much about it, so she relaxes. The first woman will have elevated levels of the stress hormones cortisol and adrenaline. The second won't. Do these levels have anything to do with the situation itself? Not so much. They've more to do with how each individual *feels* about the situation.

The same kind of thing happens with kindness. As I explored in my books *The Five Side Effects of Kindness* and *The Little Book of Kindness*, the opposite of the feeling of stress is the feeling induced by kindness.[25] Most of us assume that the opposite of stress is peace, calm, or a feeling of relaxation, but these states represent the absence of stress, not its opposite.

In research that recorded people's daily stress score and the approximate number of kind things said or done, stress and kindness sat opposite each other: as if on a see-saw, as kindness

went up, stress came down, and vice versa. It didn't mean that kindness causes an absence of stressful events, only that both feelings can't coexist and so as we increase feelings induced by kindness, these take some of the sting out of normally stressful events. Therefore, if you want to reduce stress, try kindness.

Kindness Hormones

Just as feelings of stress produce stress hormones, kindness has its own biological products. I call these kindness hormones in my books and blogs, to point out that they're produced by *feelings*, just as stress hormones are.

The main kindness hormone is oxytocin. Well known for its importance in reproduction, breast feeding, and even social bonding, and occasionally going by such affectionate names as the love drug, the hugging hormone, and even the cuddle chemical, oxytocin also plays a considerable number of other key roles in the body.

Oxytocin protects the cardiovascular system, and just as stress hormones increase blood pressure, this kindness hormone lowers it. It also has antioxidant and anti-inflammatory properties, helps with digestion and wound healing, and is even involved in the construction of heart muscle and many other cell types from stem cells.

At around 500 million years old, the oxytocin gene is one of the oldest in the human genome, and during that time, it has integrated into many important functions in the human body. What this means is that all of these functions are impacted by how kindness *feels*, just as many functions in the brain and body are impacted by how stress feels.

Most prior work in this area of research has charted the course of stress through the brain and body. We're only now beginning to examine the side effects of positive feelings, and they're plentiful. Psychologically, positive feelings increase happiness, build resilience, and protect against depression. They impact brain function and even cause neurological changes if they're experienced over a period of time; they also reduce inflammation and even help us to live longer.

Both positive and negative feelings can be induced in a real situation or an imagined one. Just as your brain doesn't distinguish between a real stressful event and an imagined one, it's the same with kindness.

Your brain will produce kindness hormones when you're being kind, witnessing an act of kindness, imagining one, or even recalling one.

In each case, you feel how kindness feels and your feelings trigger the physiological effects as a consequence. Thinking of things that annoy us fuels feelings of stress, and subsequently the physiology of stress. Thinking kindness does the opposite – thinking kind things about people, which *generates* kind feelings, can be a simple way to reduce stress.

More Visualization Studies

Carey Morewedge, then at Carnegie Mellon University in the USA, invited volunteers to eat sweets or cubes of cheese and others to imagine eating the sweets or cheese.[26] He found that

real and imagined eating impacted appetite in more or less the same way.

Just as eating food gradually reduces appetite by activating specific brain regions – otherwise we'd never stop – imagining eating seemed to have the same effect. Morewedge reported that research is revealing that the division between real and imaginary, as far as the brain is concerned, is becoming increasingly blurred.

It's important to be aware that the volunteers in this study had to imagine the *entire* process of eating. Making a quick mental picture of the sweet or cheese wouldn't work: they had to imagine picking up the food and chewing it in the same way they would if they really were eating it – bite for bite, chew for chew. If they'd usually chew 10 times before swallowing, they had to imagine chewing 10 times before imagining swallowing.

Even the immune system responds to the imagination. Following research in which volunteers were able to increase immune system antibodies by visualizing their increase, researchers at the United Lincolnshire Hospitals NHS Trust in the UK conducted a randomized controlled trial of women receiving treatment for breast cancer.[27]

All of the women received their normal scheduled treatment (chemotherapy, surgery, radiotherapy, and hormone therapy), but half also did daily visualization sessions. Each woman randomized to the visualization group visualized her immune system destroying cancer cells. Many imagined their immune cells as piranha fish or even as a Pac-Man character. Some visualized macrophages gobbling cancer cells.

The women who visualized were found to have much higher levels of key immune cells, such as natural killer (NK) cells, T cells, and T helper cells, than those who didn't visualize, and this was even after four cycles of chemotherapy. Publishing in the respected journal *The Breast*, researchers reported that the immune system was still showing high cytotoxicity against cancer cells after the four cycles, but only in the women who were visualizing their immune cells destroying cancer cells.

Positive Affirmations

The key to making visualization work is repetition, which has been shown to impact brain networks, shaping them in the direction of producing what it is we're imagining. My first experience of this kind of repetition was positive affirmations, which do something similar. The *Psychology Dictionary* defines an affirmation as 'a brief phase which is spoken again and again in an effort to plant seeds of happy and positive notions, conceptions, and attitudes into one's psyche.'[28]

In the late 19th century, the French psychologist Émile Coué noted that his patients often recovered faster if he helped them to expect to get better. So he developed what he called autosuggestions, the best known of which is 'Every day, in every way, I'm getting better and better.'

Nowadays we refer to autosuggestions as positive affirmations, or as positive self-affirmations when they affirm our core values. They help us to think and feel more positive and, as a consequence, take positive affirmative action.

Serious research into affirmations began in the 1980s, when the American social psychologist Claude Steele published a paper on his self-affirmation theory.[29] This posits that humans are fundamentally motivated to maintain a positive self-view – that is, a general perception of ourselves as good, virtuous, competent, stable, capable of free choice, and as having a sense of control over important outcomes in our lives.

Self-affirmations, then, are statements that affirm our core values; for example, if one has a core value of kindness, the affirmation would be something like: 'I am a good person.' Research has shown that when we state something that affirms our values in this way, it makes us think and feel more positive; we're also much more likely to indulge in healthy behaviors and are more likely to take positive steps to improve our lives. This is especially the case when affirmations are repeated.

Changing Our Behavior for the Better

A study by scientists at the University of Pennsylvania in the USA showed that this may be because repeating affirmations produces physical changes in specific brain regions associated with self-processing.[30] Repeating affirmations didn't just make the volunteers feel a little better or more positive in the moment, it actually altered brain networks that essentially wired in the feeling. And those brain changes were found to account for a subsequent change in the volunteers' behavior.

A collaboration between scientists at the universities of Aston, Sussex, and King's College London, published in the *Journal of Sport and Exercise Psychology*, examined the effect of self-affirmations on healthy behavior.[31] They enlisted 80 volunteers, half of whom

were randomized to work on self-affirmations, while the other half were in a control group.

The volunteers wrote self-affirmations based on their most important personal values. They were then shown a fact sheet that outlined the benefits of exercise, such as improved mood and better health, as well as the risks of a sedentary lifestyle, such as an increased risk of heart disease.

When followed up just one week later, the volunteers who did the self-affirmations were undertaking significantly more physical activity, had more positive attitudes toward exercise, and had higher intentions to exercise than those in the control group, who hadn't done any affirmations.

A study at the University of Sheffield in the UK found that changes in healthy behavior applied to diet too.[32] Ninety-three women were randomized either to write self-affirmations or be in a control group. They were then shown information about the health benefits of eating fruits and vegetables. Over a week, those women who did the self-affirmations ate, on average, 5.5 more portions of fruits and vegetables than those who didn't do the affirmations.

Research has also shown that self-affirmations can be very helpful for those times in our lives when challenges and threats can seem like mountains to climb – which is essentially what Émile Coué's affirmation was designed to do.

Self-affirmations can help us to overcome stress and make gradual improvements in our lives and in our health.

According to psychologists at UC Santa Barbara and Cornell University, this is because self-affirmations help us to expand and broaden our sense of self, while at the same time making a challenge or threat seem smaller.[33] It's a relative shift: affirmations make us feel bigger and the threat or challenge seems smaller as a consequence.

Affirmations were greatly popularized from the 1980s onward by Louise Hay, one of the founders of the self-help movement, who had noted that many of her therapy clients who presented with the same symptoms or conditions had a similar attitude or way of thinking about themselves. She often gave them positive affirmations, as Coué did, which helped steer their thinking in a healthier direction. Many of these affirmations can be found in Hay's book *You Can Heal Your Life*.