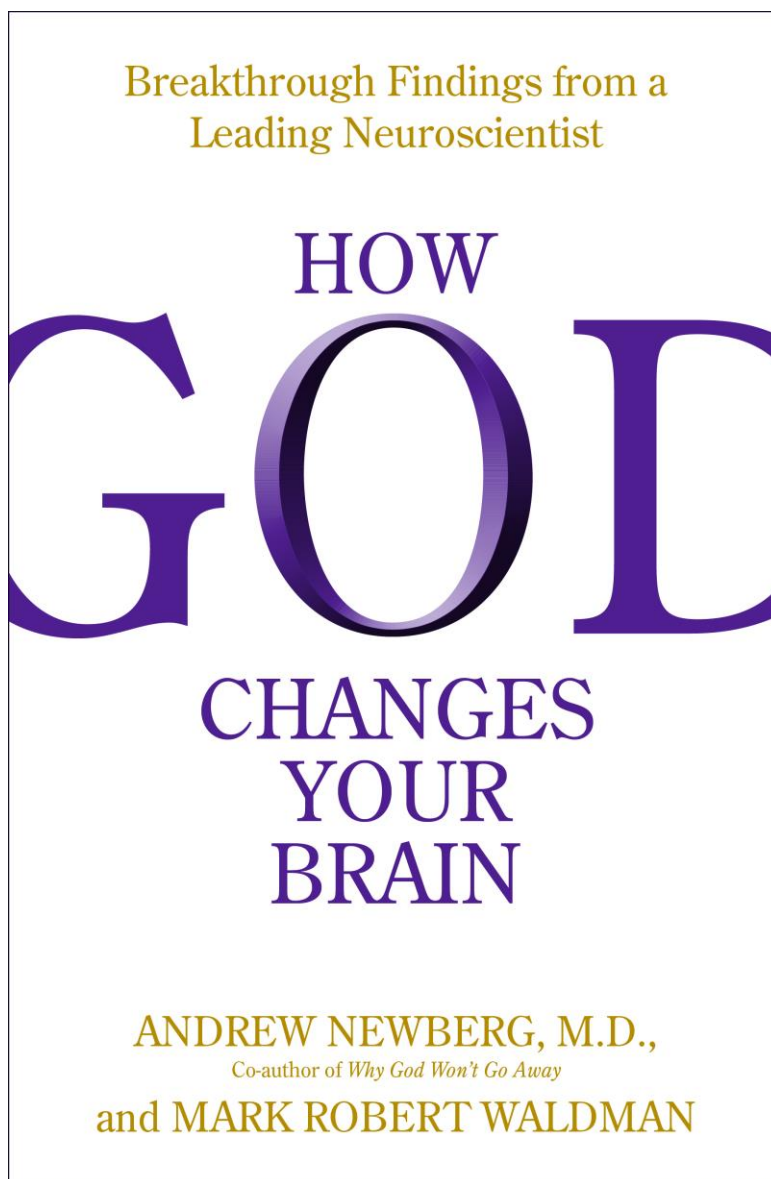


**The Best of**  
***How God Changes Your Brain***  
**Breakthrough Findings from a Leading Neuroscientist**

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## Chapter 2

### **Do You Even Need God When You Pray? Meditation, Memory, and the Aging Brain**

In the summer of 2006, I began a new line of research to see if meditation could have a positive effect on patients suffering from memory problems. As you know, the older we get the more prone we are toward cognitive impairment, so we all have an investment in keeping our brain healthy, happy, and wise. Now, there are lots of things we can do to add extra years to our lives, but after we turn thirty, brain metabolism slowly begins to decline.<sup>1</sup> We don't really notice this until our later years, but like the engine of an aging car, things begin to break down. Gaskets can leak, the transmission fluid starts to dry out, and the spark plugs begin to misfire. Bit by bit, we lose the optimal balance of neuroplasticity, and this affects our memory, coordination, attention span, information processing, problem solving, and social decision-making skills.<sup>2</sup> Unlike a car, we can't overhaul the brain or replace the electrical wiring with new parts. But you can give it a tune up by "exercising" it in different ways.

Pharmaceutical companies are well aware of our national obsession for staying young,, which is why they have invested billions of dollars in search of a chemical fountain of youth. I, however, was looking for evidence that meditation and prayer could be a better, cheaper, and safer way to go, so you can imagine my delight when I received a grant from the Alzheimer's Research and Prevention Foundation. The medical director, Dr. Dharma Singh Khalsa, asked me to investigate how a specific form of meditation might affect the neural functioning of patients who suffered from memory loss.

This was very exciting for me. Our prior research showed how advanced meditators could consciously alter the normal functioning of different parts of the brain, but it did not answer the deeper question: Could meditation change our neural chemistry and circuitry in ways that enhanced our cognitive skills? And if it did, would such changes be temporary or permanent?

For years, these questions have been an issue of considerable debate, and now we had an opportunity to find out. To make things more interesting, we'd be working with people who had little or no experience with meditation. We could actually watch what changes took place in the brain over time, and document them.

The practice that we investigated is called Kirtan Kriya Yoga. The technique has its roots in the 16<sup>th</sup> Century Sikh traditions of Northern India, and it became popular in the United States in the 1970s and 80s.<sup>3</sup> Specifically, this form of yoga integrates three elements: breathing, sound, and movement. The first element involves the conscious regulation of one's breath, and it is the foundation of many forms of Eastern meditation. Numerous well-documented studies have demonstrated how different forms of yoga and focused breathing can effectively reduce stress, blood pressure, anxiety, and a host of other health-related problems,<sup>4</sup> while increasing alertness and cognitive functioning.<sup>5</sup> In other recent studies, breathing meditations have been shown to have an effect on the regulation of immunity, aging, and cell death.<sup>6</sup>

The second element of Kirtan Kriya Yoga involves the repetition of four sounds –Sa, Ta, Na, and Ma – which can be done either silently or aloud. Known as a mantra, it is similar to the Catholic tradition of repeating a brief prayer for a certain length of time. In Eastern traditions, there are hundreds of different mantras. Many have sacred or symbolic meanings, and others simply involve the repetition of primal sounds. Mantras are often cited in spiritual texts, and they

may be assigned to an initiate by a spiritual teacher, but they are all very simple and easy to recall. Mantras and repetitive prayers like the Rosary have been shown to have a distinct, powerful, and synchronous effect on the cardiovascular rhythms of practitioners,<sup>7</sup> and we hoped that our brain-scan study would shed additional light on this particular type of meditation.

The third part of the Sikh meditation technique involves specific movements of the fingers. In the East, hand, face, and body gestures are called mudras, and in the Kirtan Kriya tradition, you sequentially touch your fingers with your thumb as you pronounce each of the four sounds: Sa, Ta, Na, and Ma. The technique bears a similarity to the counting of prayer beads, a universal practice that can be found in Christianity, Islam, Hinduism, and Buddhism.

From a spiritual perspective, each mudra or mantra is associated with a theological or metaphysical idea,<sup>8</sup> but from a scientific perspective, any form of repetitive movement or sound helps to keep the mind focused.<sup>9</sup> This particularly interested me because the neural deterioration of aging often affects muscle coordination and verbalization skills. Thus, Kirtan Kriya yoga seemed to be an excellent meditation with which to experiment. It was easy to learn and do, and we set up the experiment in a way that eliminated the need for the patient to embrace any specific religious belief. Best of all, our patients would only have to practice for 12 minutes a day. As it turns out, most other meditation studies have focused on rituals that last for much longer periods of time.

### **Meditation for Construction Workers?**

Anyone, I thought, should be able to do this meditation with the minimal amount of instruction, but when Gus walked into my clinic, I suddenly had doubts. In all of our previous studies, our subjects had nurtured spiritual and meditative practices for years. Gus had never meditated, and he wasn't interested in religion. He just wanted his faltering brain to function better.

Gus was a relatively large man, a bit rough around the edges, but very pleasant. He seemed more like a plumber you'd meet on a construction site—you know, someone who was likely to zone out in front of the television with a couple of beers by his side. He just didn't seem to be a meditation type of guy. Indeed, when I described the exercise to Gus, he clearly looked unhappy, but after we explained the purpose of the study, his enthusiasm returned.

“When should I do it?” he asked.

“First thing in the morning, just after you get up.” I said.

He thought for a moment, then replied, “The instructions said to ‘sing out’ during the meditation,\* but I’m usually up around 5:00 am, getting ready for work. I’m afraid I’ll wake up everyone in the building!” Gus, it turns out, was an industrial mechanic.

I knew what he meant because I had tried the mantra a couple of times and felt very self-conscious. After all, it does seem somewhat strange to be loudly chanting “Sa Ta Na Ma,” especially if you live in a crowded apartment complex in downtown Philadelphia. I told him that he could do it a little later, or, if he preferred, he could say it quietly.

Still, he seemed concerned. He wanted to do it “right” because he felt that his mental health was at stake, and so I reassured him that it would not diminish the success of the practice. He felt satisfied with my response, and we proceeded to give him a series of tests to evaluate his cognitive abilities.

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\* The term “Kirtan” refers to a North Indian style of devotional singing, and so the mantra is spoken lyrically, not chanted. The CD that we sent home with our subjects included a guitar accompaniment as well.

Then I took the first of four brain scans. The first one is called a baseline scan, during which he simply sat quietly for 10 minutes listening to an intellectual description of the meditation practice. The images I recorded would serve as a marker, to be compared to later scans that measured the activity in his brain at the end of the eight week training program.

Next, I described the meditation in detail and played him a video CD that demonstrated the technique. I asked him to practice it by following along with the person on the video, and then we took the second scan so that we could see what was happening in his “untrained” brain during the meditation. We do this by injecting a radioactive tracer through an IV tube during the last few minutes of the meditation. The tracer marks the cerebral blood flow activity by leaving a temporary residue in the brain. Then, when the meditation is complete, we can casually walk down to the room where we take the scans. The cameras would pick up the activity that had occurred during the peak moment of the meditation.

I sent him home with the CD so that he could practice every day, and we called him every two weeks to monitor his progress and answer any questions he might have. Each time we called, he replied that he was doing it faithfully and that everything was going well. Eight weeks later, he returned to our lab for further testing and brain scans.

“I really enjoyed it!” he said. “It was great, and I plan to keep doing it.” We got a similar response, as well, from our other 12 subjects, who, like Gus, were complaining of memory problems. They, too, were everyday people who had never done any substantial meditation in their lives. Personally, I was amazed, yet pleased, at their willingness and eagerness to practice regularly. Obviously, they wanted to gain the maximum effect, and they knew that we would be tracking them in order to assess the long-term improvements in cognition.

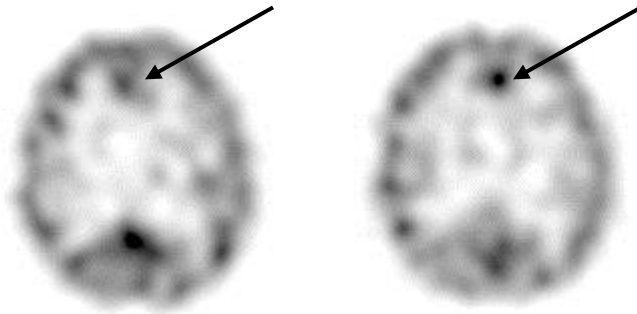
Of course, the big question was: *Did it work?* Would we find any significant changes in the brain, and would there be any improvement of memory? Our other studies had shown *how* the brain changes during intense meditation and prayer, but our prior subjects had at least ten years of intense daily practice lasting 45 minutes or longer. Our memory patients would have only eight weeks of a 12-minute practice. That’s a big difference, and so our study would help to identify how long it might actually take to make significant neurological changes. Such information might also help to identify the degree of neuroplasticity that remains when we enter the remaining decades of life.

We know that if you do cardiovascular exercise, you enhance your physical and emotional health, but there is only a small body of evidence supporting the notion that meditation can enhance your cognitive health. Then there’s the problem of complexity. The brain has a hundred billion neurons that connect to others in trillions upon trillions of ways, and no two people have the exact same configuration of connections. As things currently stand in the field of neuroscience, we only have a vague map of a small percentage of the neural circuits that control our emotions, behaviors, and thoughts. Still, the slowly accumulating evidence points to the very real possibility that meditation is an excellent exercise for maintaining a healthy brain.

### **Protecting and Strengthening Your Aging Brain**

Returning to Gus: Did he or did he not alter the normal function of his brain after eight weeks of practice? He did! I took our second resting scan of Gus, and we discovered that there was a significant increase of neural activity in the prefrontal cortex, an area that is heavily involved in helping an individual to maintain a clear, focused attention upon a task. The anterior was also activated, a structure that is involved with emotional regulation, learning, and memory,<sup>10</sup> and is particularly vulnerable to the aging process.<sup>11</sup> The anterior cingulate plays a

major role in lowering anxiety and irritability, and it also enhances social awareness, a feature that also tends to deteriorate with age. Throughout this book, we will often return to the importance of this structure in the brain, and the ways in which it is stimulated by a variety of meditative practices.



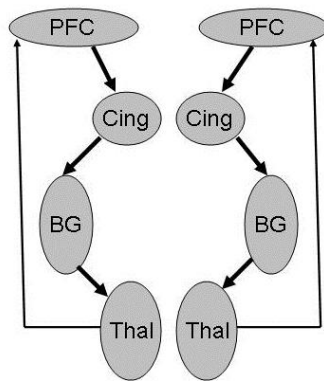
**Scans before and after 8 weeks of Kirtan Kriya practice showing increased activity in the anterior cingulate (arrow)**

Not only does activation in the prefrontal lobe and anterior cingulate improve memory and cognition, it also counters the effects of depression, a common symptom in age related disorders.<sup>12</sup> Parkinson's and Alzheimer's patients also show reduced metabolic activity in the anterior cingulate cortex,<sup>13</sup> and this suggests to us that the Sikh meditation technique should slow down the deterioration caused by these diseases. Personal religious practices and higher levels of spirituality are also associated with slower progression of Alzheimer disease.<sup>14</sup>

Other meditation studies have shown similar benefits. In 2007, researchers at Emory University found that Zen meditation had “neuroprotective effects and reduced the cognitive decline associated with normal aging.”<sup>15</sup> Overall, the evidence clearly demonstrates that most forms of contemplative meditation and yoga will exercise your brain in ways that maintain and promote cognitive health and vitality.

Brief prayer, however, has not yet been shown to have a direct effect upon cognition, and it even appears to increase depression in older individuals who are not religiously affiliated.<sup>16</sup> However, when prayer is incorporated into longer forms of intense meditation, or practiced within the context of weekly religious activity, many health benefits have been found, including greater length of life.<sup>17</sup> Prayer is also associated with a sense of connection to others,<sup>18</sup> but the reason that it may have little effect on cognition has to do with the length of time it is performed. Prayer by is generally conducted for only a few minutes at a time, and we believe that it is the intense, ongoing focus on a specific object, goal, or idea that stimulates the cognitive circuits in the brain.

Our brain-scan study showed that the meditation Gus performed strengthens a specific circuit—involving the prefrontal and orbital-frontal lobe, the anterior cingulate, basal ganglia, and thalamus—that that would otherwise deteriorate with age.<sup>19</sup> This circuit governs a wide variety of activities involved with consciousness, clarity of mind, reality formation, error detection, empathy, compassion, emotional balance, and the suppression of anger and fear. When this particular circuit malfunctions or deteriorates, it contributes to the formation of depression, anxiety, obsessive-compulsive behavior, and schizophrenia. We can keep this circuit healthy, and even improve it, by incorporating meditation into our daily activities and rituals, regardless of our beliefs.



Schematic showing the circuit activated by Kirtan Kriya yoga: the prefrontal cortex (PFC), Anterior cingulate (Cing), Basal ganglia (BG) and Thalamus (Thal). During meditation, we become more focused and alert (PFC), more empathic and socially aware (Cing), and can better control our body movements and emotions (BG). This affects our sensory perception of the world (Thal) and this information is relayed to other parts of the brain.

### The Amazing Plasticity of the Brain

Next, we asked Gus to perform his meditation in our lab. We again injected him with a dye, as we had done eight weeks before, and we took another scan. We wanted to see if his brain responded differently to the meditation than when he first tried it out, and we discovered that towards the end of the 12-minute practice, there was decreased activity in the parietal lobe, a part of the cortex that is involved with constructing our sense of self.

In our brain-scan studies of nuns and Buddhists, we also found decreased activity in the parietal lobe. When this happens, one's sense of self begins to dissolve, allowing the person to feel unified with the object of contemplation or intention. For the nuns, their goal was to come closer to God. For the Buddhists, it was to experience pure consciousness and awareness. But for Gus, he became unified with his goal of improving memory. We don't fully understand the reason for it, but it appears that a loss of self-consciousness enhances one's intention to reach specific goals. A loss of one's sense of self also appears to improve one's ability to perform a variety of tasks, with greater pleasure.<sup>20</sup> In sports, it's called being "in the zone," and in psychology, this state of optimal experience is called "flow."<sup>21</sup>

Gus's scans showed that it takes less than two months to alter the overall neural functioning of the brain. This is amazing because it demonstrates that we have the power to consciously change our brains, and improve our neural functioning, in far less time than scientists used to think. As I mentioned in Chapter 1, we can see permanent changes in single neurons in a matter of days, and as other studies have shown, most forms of meditation will create subtle but significant changes in a couple of months. Will they be permanent? It's too early to tell concerning cognitive enhancement, but we know from our own studies that advanced meditators who have practiced for years show substantial differences in their brain when compared to non-meditators. These differences can even be seen when the person is not meditating, but again, we don't know if the brain would return to "normal" if the meditation practice was given up. It's probably similar to exercise: the more the better, but if stop doing it, the benefits will fade away.

As we mentioned earlier, we found significant increases in the prefrontal cortex and the anterior cingulate, areas that are essential for keeping one's attention focused on a task. Other types of meditation and yoga practice stimulate these same areas, but with our memory patients, we also found a significant increase in the cerebellum, which plays an important role in integrating conscious movements of the body. This makes sense since the hand movements of the Sikh meditation would necessarily involve the motor coordination areas in the brain.

Gus also showed increased activity in his globus pallidus, which is part of the basal ganglia lying deep within the center of the brain. The basal ganglia helps to control voluntary movements, posture, and motor sequencing, but it also plays an important role in memory formation, behavioral control, and cognitive flexibility.<sup>22</sup> Abnormal functioning in this area is associated with normal aging<sup>23</sup> and movement disorders<sup>24</sup> like Parkinson's, Alzheimer's, Tourette's, and Huntington's disease.<sup>25</sup> This suggests to us that movement-based meditations, more so than passive meditations, should strengthen the neural functioning of those parts of the brain that are susceptible to many age-related diseases. However, other forms of meditation, such as Zen, also improve cognition by strengthening different circuits of the brain that normally decline with age.<sup>26</sup>

### **Testing Gus's Cognitive Skills**

After we took the second set of scans, we re-administered our cognitive measurement tests to see if his memory had improved. We were astonished. On one of the tests, he showed almost a 50% improvement. Known as the Trails Test,<sup>27</sup> it's like an advanced connect-the-dots game. The test has been used for decades to assess a wide range of cognitive functions because it requires visual scanning, visual-motor coordination, and visual-spatial ability. Before the meditation practice, Gus took 107 seconds to complete the task. After following the Kirtan Kriya program, he completed the task in 68 seconds.

Some of our other subjects showed less improvement, but all of them showed enhanced abilities in memory recall, concentration, and verbal fluency. The overall improvement averaged between ten and twenty percent. This is very impressive, because eight weeks is, as we mentioned, a very short time to measure these kinds of changes. Since we plan to follow our patients over a period of several years, we expect to see continuing improvement in a variety of cognitive skills. However, as other cognitive studies have shown, you need to exercise your brain continuously to maintain the benefits achieved.<sup>28</sup>

### **Meditation Without God**

This was our first real evidence that a meditation practice, even when removed from its spiritual and religious framework, can substantially improve the memories in people suffering from cognitive problems. This is good news for millions of aging Americans, because it is easy to get into the habit of meditating 12 minutes a day.

Our study also shows that meditation can be separated from its spiritual roots and still remain a valuable tool for cognitive enhancement. Thus, different types of meditation can be introduced into our public school systems to improve our children's academic performance. In a longitudinal study completed in 2007, students showed "decreased test anxiety, nervousness, self-doubt, and concentration loss" simply by using a deep breathing technique.<sup>29</sup> In another study, supported in part by a grant from the National Institutes of Health, researchers at the Medical College of Georgia found that African-American adolescents who were trained in a simple meditation (involving relaxation, breathing, and the repetition of a sound) showed a significant decline in "absenteeism, school rule infractions, and suspension days."<sup>30</sup> Students who took up Tai Chi (a gentle movement exercise) at Boston Public Middle School reported enhanced personal well-being and social awareness.<sup>31</sup> And for a group of young teens who attended a yoga camp, their spatial memory scores improved by 43%.<sup>32</sup> What teacher or parent, when shown this evidence, would not want teach their children how to meditate, breathe, and relax?

## Gus's Legacy: The Power of Selective Attention

Gus symbolizes the brain's remarkable capacity to heal itself and change, especially in the areas that make us uniquely human: our frontal lobes. Here we find the neurological roots of our imagination and creativity, of our capacity to reason and communicate with others, and our ability to become more peaceful, compassionate, and motivated.

Our frontal cortex holds the secret for making our dreams come true. That secret can be summarized in two words—*selective attention*—the ability to voluntarily choose, from millions of pieces of data, which ones seem most relevant to your life. Daily meditation enhances our ability to focus our attention on virtually any goal we wish to achieve, and selective attention improves the memory functions of the brain. Specifically, meditation helps to maintain working memory—the information we need to make any conscious decision—and it does this by discarding irrelevant and distracting data.<sup>33</sup> Our study specifically showed changes in those parts of the brain that are related directly to the structures that are part of the working-memory circuit.<sup>34</sup>

Spiritual experiences, and the techniques we use to evoke them, involve a complex network of interconnecting neural functions that are equally influenced by our thoughts, feelings, memories, physical conditions, genetic predispositions, and the personal experiences we've had throughout our lives. But the key to meditation—and thus our ability to change our brain—can be reduced to a handful of specific steps. Thus, Gus's memory improved for the following reasons:

1. He *wanted* to improve.
2. He stayed *focused* on his intention and goal.
3. He consciously *regulated* his breathing, posture, and body movements.
4. He *practiced* the skill over a period of time.

The first step begins with a desire—the *conscious* wish to change. Once that decision is made, you must train yourself to remain focused on your goal. This takes practice, but our experiments suggest that this happens rapidly. Focused attention begins to build new neuronal circuits that, once established, will automatically activate those parts of the brain that involve motivational activity. And the more that activity is repeated, the stronger those neural circuits become. This mechanism is known as Hebbian learning—often stated as “cells that fire together, wire together”—and it is the primary mechanism by which all living organisms gain new knowledge about the world. Repeating a new task, such as meditation or prayer, changes the synaptic activity at the end of a neuron and will eventually change the structure of the cell.<sup>35</sup> Such changes affect the way information is relayed to other parts of the brain.

Desire and focus is enough to permanently alter the brain, but spiritual devotees have discovered additional ways to improve neural functioning. Regulated breathing will affect mechanisms that control emotions and sensory perception, but if you do it too deeply, you can evoke hallucinogenic visions and sounds. Slower regulated breathing has a calming effect on both your body and mind, and it also decreases metabolic activity in different parts of the brain. This is very important because our frontal lobe tends to be overly active. It uses up a lot of energy that is needed to efficiently run other neural mechanisms, and so we need to give this part of the brain a rest. Thinking uses up a lot of neural energy, but slow, deep breathing replenishes it.



The Sa-Ta-Na-Ma meditation, like other spiritual practices, allows your brain to rest while maintaining an acute awareness of the environment, which turns out to be a very useful skill to develop. By adding repetitious hand movements and speech to your meditation, you further enhance the motor and coordination centers in your brain. Thus, by increasing efficiency throughout the brain, more neural and metabolic energy is conserved. This, in turn, enhances memory formation and retrieval.

Gus wanted to improve his memory, and so he did. But other people, using similar meditation techniques, have achieved other significant goals. Some have created lasting states of tranquility and peace, while others have become more productive at work. When you intensely meditate on a specific goal over an extended period of time, your brain begins to relate to your idea as if it were an actual object in the world. The concept begins to feel more obtainable and real, and this is the first step in motivating other parts of the brain to take deliberate action in the world.

### **Having Faith in Reaching Your Goals**

Underlying these four steps—desire, focus, regulated body control, and practice—is a fifth process, one that is essential for obtaining your desire or goal. We call it *expectation*, a term, much like faith, that reflects our neurological propensity to believe that we can, and will, accomplish our goals. Expectation is different from hope because it gives you the inner conviction that your goal is attainable, even if it seems irrational. It is one of the underlying principles of optimism, and it also governs the neurological mechanism known as the placebo effect. If you strongly believe in something—in other words, if you have enough faith in your self—you will stimulate both your immune system and your motivational system into action.<sup>36</sup>

This explains why popular self-help books like *The Secret* and *The Passion Test* are successful.<sup>37</sup> They emphasize the importance of intently focusing on your goal, and that if you maintain optimism and faith, your dreams will eventually come true. From a neurological perspective, there is a measure of truth in this. This is not a magical process, nor something that quantum physics validates. Rather, it is simply the brain doing what millions of years of evolution have led it to do: accomplish goals that we set our minds to. The same is true for religious pursuits. If you set your mind on reaching a spiritual goal, you'll neurologically enhance your sense that a spiritual reality can be experienced. One can argue that Abraham, Moses, Mohammed, Jesus, and the Buddha all reached spiritual enlightenment because they devoted years to intense meditation and prayer. And we believe that cognitively impaired patients like Gus can similarly reach their goals of memory enhancement through the practice of daily meditation.

### **Protecting the Aging Brain**

The evidence clearly shows that most forms of contemplative practice will improve cognition, but how do you decide which technique to use? More to point: is the Sikh meditation that Gus used better than other spiritual practices? It will take a long time before we have a definitive answer, but we do have several working hypotheses supported by the years of research that we and others have done.

We believe that the Sikh meditation is more likely to show improvement in memory and cognition because it incorporates six different neural-altering techniques: relaxation, breathing, chanting (mantra/word/sound repetition), coordinated finger movements, background music, and intense concentration. Many other meditations only use one or two of these methods. We'll talk

more about the benefits of relaxation, breathing, and concentration in Chapter 9, but for now, I want to take a few moments to review the effects that repetitive movements, sounds, and music on the brain.

Numerous studies have shown that the mere repetition of a sound, phrase, or finger movement over a period of time significantly reduces symptoms of stress, anxiety, depression, and anger, while improving the practitioner's perception of quality-of-life and spiritual well-being.<sup>38</sup> In fact, the addition of movement to any meditation should significantly enhance the cognitive performance of the brain.<sup>39</sup> Repeated, skilled finger movements also appear to improve the central and peripheral nervous systems, offsetting the age-related loss of hand control.<sup>40</sup> In one study, musicians who used repeated finger movements had lower rates of dementia,<sup>41</sup> and in another study, early musical training with children resulted in the "long-term enhancement of visual-spatial, verbal, and mathematical performance."<sup>42</sup> In fact, it is fair to consider any musical training a form of cognitive meditation because it involves intense concentration, repetition of instructional techniques, and motivational attention.

There is even considerable evidence documenting the effects of pleasant music on the brain. It deepens emotional experience,<sup>43</sup> enhances visual and auditory processing,<sup>44</sup> and improves attention and the processing of emotions.<sup>45</sup> Thus, we recommend that you play some classical or melodic music in the background when you meditate or pray.

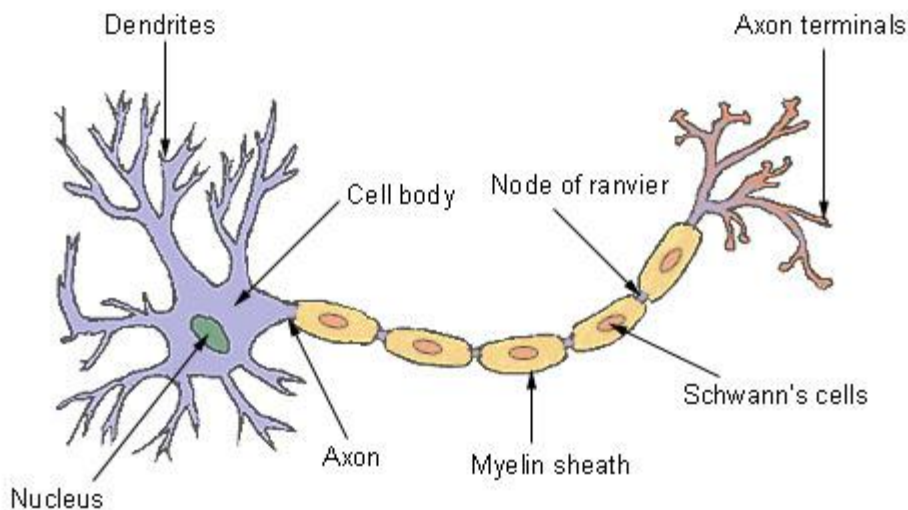
We also want to point out that there is considerable interplay between the brain mechanisms that regulate anxiety, stress, and memory.<sup>46</sup> For example, high levels of stress lead to memory decline and increase the risk of developing Alzheimer's disease.<sup>47</sup> Again, most of the meditations we will be discussing in this book will trigger the body's relaxation response and thereby lower stress. And as most people know, stress is the #1 killer in America because it damages every organ in the body—especially your brain.

### **Exercising Your Dendrites**

Our current understanding of the human brain shows that subtle deterioration in any part of a neuron—in its coating, synapses, or the way it responds to neurochemicals—will impede cognitive function.<sup>48</sup> But the real key to understanding cognitive enhancement and deterioration may lie in the microscopic dendrites that are on the receiving ends of neurons. In fact, they may even harbor the secret to why humans—and only humans—contemplate the nature of God.

A single neuron can have as many as ten thousand little tentacle-like branches that reach out toward the signaling ends of other neurons. Picture if you will, the roots of a giant tree: these are the dendrites, collecting information and sending it up into the body of the neuron (the tree trunk), which then decides which other dendrites to stimulate through the axon terminals (the leaves) that grow out of the ends of the neuron's "branches."

### Structure of a Typical Neuron



**In this simplified drawing, dendrites receive signals from other neurons and pass the information to the axon terminals that will release neurotransmitter signals to other neurons.<sup>49</sup>**

Mild, short-term, or chronic stress impairs memory by disrupting dendritic activity.<sup>50</sup> Researchers working with rats (whose brain functions are remarkably similar to humans) found that it only took only one week of mild stress to cause significant alterations in dendrite organization and growth.<sup>51</sup> But, if the situation that is causing the stress is removed, dendritic function is restored.<sup>52</sup> But not completely, for nearly one third of the damaged dendrites were permanently lost if the stress was later repeated.<sup>53</sup>

Dendritic loss in the prefrontal cortex has also been found in aging humans.<sup>54</sup> For example, we have known for decades that Alzheimer's patients suffer dendritic loss.<sup>55</sup> However, increased synaptic activity, which occurs in the prefrontal lobe and other parts of the brain when we meditate, tempers the effects of the loss.<sup>56</sup> This is why we believe that meditation will help maintain dendritic function, because it lowers the overall levels of stress while simultaneously stimulating cognitive alertness. In fact, the evidence now suggests that the more you exercise your brain, the more you can slow, or even reverse, dendrite deterioration, and thus preserve your memory and cognitive skills. In Chapter 8, we'll discuss the eight best ways to enhance the neural functioning of your brain.

### Designing a Personal Memory-Enhancement Meditation

For years, scientists have known that simple memory exercises—for example, playing mahjong or memorizing random lists of numbers or names—can enhance a variety of cognitive functions, especially for people who are older than 50.<sup>57</sup> But as we will explain later in this book, meditation appears to be more effective when it comes to strengthening the neural circuits in your brain.

In essence, the more you exercise your brain—mentally, physically, socially, and contemplatively—the healthier it becomes. Even more interesting, as researchers at the Stockholm Gerontology Research Center and the Aging Research Center in Sweden discovered, if you custom design your own memory-enhancing program, you'll show even greater

improvement, along with an increased willingness to practice.<sup>58</sup> So why not apply this strategy and create a personalized memory-enhancement meditation? The key elements are simple: maintain a state of relaxed awareness, regulate your breathing, and perform a simple or complex movement with any part of your body. As you do this, sing, chant, or silently repeat a sound or phrase that has personal meaning, and practice for at least twelve minutes each day. And don't forget the most important step: be clear about the goal you wish to reach. In Chapter 9, we'll give you specific instructions for practicing variety of basic meditation techniques.

If you would like to follow the meditation technique we are using in our study, you can sing Sa-Ta-Na-Ma as you touch each of the fingers on your hand. But if you prefer, you can chant "Nam-Myoho-Renge-Kyo" as the Nichiren Buddhists do, or "Om-Mani-Padme-Om," or "Our Father in Heaven," as you touch your fingers. All will be equally effective. You can even do multiplication tables, but we believe that your meditation will be far more enjoyable, and perhaps more effective, if you substitute words that hold deep meaning, like "Peace-Happiness-Freedom-Love." Research suggests that the more personal your mantra or prayer becomes, the more likely those qualities will be mirrored in the neural circuits of your brain.

Make the meditation as simple or as complex as you like, and feel free to vary it from week to week. However, the more complex your meditation becomes, and the longer you do it for, the more you will strengthen the neural circuits that tend to deteriorate with age. You can even meditate while you are walking, jogging, or doing calisthenics, for the more parts of your body that you move, the more parts of your brain will be stimulated.

How long will it take to make an improvement? Technically speaking, overnight, but if you want to see measurable improvements, you have to practice daily. As one recent study demonstrated, just fourteen days of daily mental and physical exercise, stress reduction, and a healthy diet was enough to improve cognition and brain function for people between the ages of 35 and 69.<sup>59</sup>

Other meditation studies have found that the greatest improvements are achieved when you practice between thirty minutes to an hour each day. After a few weeks, you should notice improvement in your attitude and emotional well-being, and if you integrate meditation with psychotherapy or cognitive-behavioral classes, you will find that you can maintain low degrees of depression and anxiety long after your therapy ends—but again, only if you continue the meditation practice of staying relaxed, alert, and focused.<sup>60</sup>

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### **Take a Coffee, Tea, and Cognition Break**

Meditation is great for your brain, but when it comes to needing an instant boost of cognitive powers, nothing beats a couple of freshly-brewed cups of java.<sup>61</sup> Coffee will even lower your risk of diabetes, gout, Parkinson's disease, and certain types of cancer.<sup>62</sup>

When the U.S. Army Research Institute investigated the effects of coffee on Navy SEAL trainees, they concluded that "even in the most adverse circumstances, moderate doses of caffeine can improve cognitive function, including vigilance, learning, memory, and mood state."<sup>63</sup> In fact, they found that for people who are exposed to severe stress, coffee provided a significant advantage when cognitive performance was critical." They found that the optimal dose was two cups of coffee (200 mg of caffeine).

Caffeine may even lengthen your life,<sup>64</sup> but there are studies showing that more than two cups may have a variety of side-effects. It may cause migraines for chronic users,<sup>65</sup> and it

appears to weaken bone structure due to the fact that caffeine leaches calcium from your body.<sup>66</sup> Caffeine tablets can also be toxic, and although rare, a caffeine overdose can kill you.<sup>67</sup>

For those who don't like coffee, green and black tea will also improve your cognition and mental health.<sup>68</sup> It has most of the physiological benefits associated with coffee, plus the added benefit of lowering your blood pressure.<sup>69</sup> It also has another ingredient, theanine, that enhances neural cognition.<sup>70</sup>

Finally, don't forget about water. Drink plenty of it, especially if you are exercising, because dehydration appears to impair cognition, motor coordination, and mood.<sup>71</sup> However, other evidence suggests that any changes—positive or negative—caused by water deprivation is minor.<sup>72</sup>

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Before we close this chapter, I want to bring up an important but often overlooked point. What you choose to meditate upon, or pray for, can do more than change your brain. You can damage it, especially if you choose to focus on something that makes you frightened or angry. In psychology, this is called rumination, and it is clearly hazardous to your health.<sup>73</sup> In a Stanford brain-scan study, people who focused on negative aspects of themselves, or on negative interpretation of life, had increased activity in their amygdala. Their brain generated waves of fear, which releases a torrent of destructive neurochemicals into the brain.

Fortunately, meditation is the opposite of rumination and is, in some ways, similar to the psychoanalytic model created by Freud. In meditation, as in therapy, we learn to watch our negativity, and not react to it. In the process, we train the brain to remain calm, even in the face of adversity. Thus, meditation becomes an exemplary way to re-evaluate life's difficulties and mysteries. But perhaps most important, it trains the mind to become less attached to its own desires, attachments, and beliefs. When this happens, the way we see the world will subtly, and sometimes profoundly, change.

## Chapter 5

### What Does God Look Like?

#### Imagination, Creativity and the Visual Representation of the World

God is both a feeling and an idea, but which comes first? Spiritual experiences appear to emerge spontaneously in human brains, but as far we can tell, they rarely occur in early childhood. Instead, young children are introduced to the *idea* of God by their parents. Through storytelling and simple religious rituals like prayer, a child begins to grasp the concept of God and what it represents. This becomes our neurological basis for future religious beliefs, and they will color our spiritual experiences for the rest of our lives.

As far as the mechanical functioning of the brain is concerned, it doesn't matter whether God is physically, mentally, or spiritually real. It only matters whether the concept is useful for survival, and since notions of spiritual realms have permeated cultural history, this suggests that religion has played an important role in helping people cope with our lives. As the biologist and

anthropologist David Sloan Wilson points out, religious belief “is intimately connected to reality by motivating behaviors that are adaptive in the real world.”<sup>74</sup>

### **Drawing Pictures of God**

All conscious thoughts and images have a neurological impact on the brain, but certain words emotionally affect a person more than others.<sup>75</sup> Even the words “yes” and “no” are processed emotionally, and in different areas of the brain.<sup>76</sup> It actually takes a person longer to respond to “no,” which suggests that the brain does not take kindly to having its behavior interrupted. In fact, it takes years to train a child’s mind to understand the concept of “no.”

But what about the word “God?” We believe that this concept has a specifically unique effect upon the brain. Based on the evidence we are about to present, we believe that children begin with a simple concrete image of God that slowly becomes more abstract and emotionally arousing, in either a positive or negative way. Indeed, God may be one of the most powerful words that a person encounters in childhood. .

In order to give you a personal sense of the neurological power of a single word, I want to ask you to do a little experiment. Grab a pencil or a pen and a blank piece of paper, and *draw a picture of God*. Be spontaneous and draw whatever comes to mind, without worrying about the quality of your art, but you must complete the drawing in two minutes. I also want you to pay attention to the first reaction you had when I asked you to draw a picture of God. When you have finished your drawing, write a brief description of its meaning below the picture.

We’ve been conducting this experiment for several years with different groups of religious and nonreligious people, and if you’re like most of the adults we’ve studied, the question probably caught you off guard. Nearly everyone pauses for a very long time—even longer than when we asked, “What does God feel like?”—and this tells us that there is increased activity occurring in many parts of the brain, especially in the visual, motor, association, cognitive, and emotional centers.<sup>77</sup> Indeed, the question appears to be so neurologically challenging and psychologically provocative that some people simply refuse to draw anything. Children, however, have no difficulty with the request, and delight in drawing their impressions of God.

For sixty years, researchers have been asking children to draw pictures in order to explore their religious concepts and beliefs. Young children, in particular, do not have the language to articulate religious concepts well, but their pictures give great insight into their feelings and thoughts. In general, children live their religious lives through imaginative daydreams and symbolism, rather than through words.

For example, in 1986, psychologist David Heller interviewed forty children using drawings, doll-play, and innovative forms of dialogue.<sup>78</sup> He found that Catholic children associated God with family. Jewish children talked about God in relationship to suffering. For Baptist children, God was controlling, providing order, organization, and structure to one’s life. Hindu children identified their gods with community. For them, a divine being symbolized energy or a force in universe, not a person.

One might assume from this that different religions generate different images of God, even among different Christian sects, but a recent study compared the drawings of children from Unitarian and Baptist backgrounds and found no significant differences.<sup>79</sup> This suggests that religious denomination has little to do with a child’s physical image of God.

Interestingly, no researcher has collected data on what adults render when asked to draw a picture of God. When we did, it provided us with some fascinating evidence about the

neurological “evolution” of religious imagery in the minds of believers and disbelievers. The evidence even suggests that atheists contemplate God with as much depth and sincerity as religiously committed believer. But before we address how adults envision God, let’s take a look at the children’s research.

### **A Child’s Image of God**

Four major studies have analyzed children’s pictures of God.<sup>80</sup> The first was conducted in 1944 by the American sociologist Ernest Harms, who amassed 4000 pictures from children between the ages of 3 and 18. In 1980, the German religious educator Hermann Siegenthaler collected 300 pictures from children 5 to 16 years of age. And in 1996, Helmut Hanisch, a professor of religious education at the University of Leipzig, gathered more than 2500 pictures from children aged 7 to 16. A fourth study, conducted in 1998 by three American university professors, analyzed 968 drawings made by children between the ages of 3 and 18.

Each researcher used somewhat subjective criteria to analyze the pictures, but together, certain common themes emerged that corresponded to the child’s age and the religious affiliation of their parents and teachers. For example, children below the age of 6 usually drew faces, while children between the ages of 6 and 10 mostly drew faces and people. God was seen a protector or a king, sometimes living in a palace or in the clouds. Occasionally, angels or biblical scenes would be depicted, but as children grew older, faces and people would be replaced by more symbolic images such as crosses, hearts, open hands, or an eye hovering in the sky. The oldest children often represented God as the sun or as radiating spirals and light. In all studies, the use of symbols increased with age.

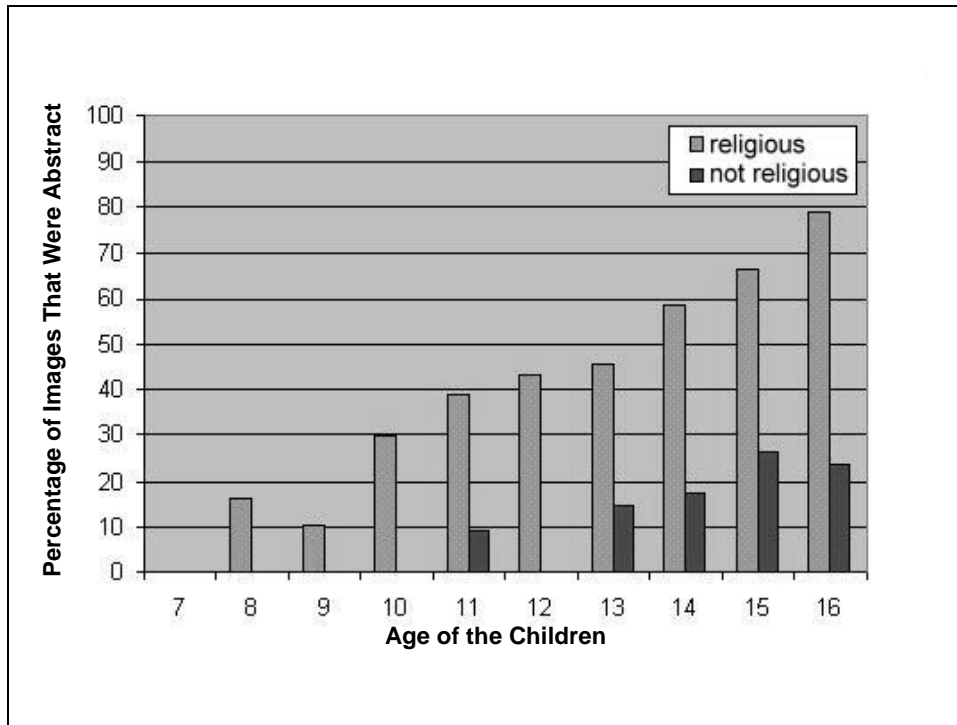


**Drawings of God from an 8 year old girl (left) and a 12 year old boy (right).  
Both children attended Christian Sunday school.**

Hanisch took the research to another level. He gathered 1471 pictures from West German children who attended Christian-oriented schools. Then he collected 1187 drawings from children who attended schools in East Germany, where an official anti-religious doctrine governed the country.

In the religious group, children between the ages of 7 and 9 represented God as a face or person more than 90% of the time, but as we saw in the earlier studies, there was a gradual decline as the children grew older. By the time they reached 16, only 20% drew pictures of faces or people. Instead, they preferred symbols like suns and circles and spirals. Commentaries from the older children reflected a loving perception of God.

This did not happen in the artwork collected from the nonreligious students. By age 16, 80% of the children still used people to symbolize God. Their comments were generally negative, referring to God as powerless and weak, and often included references to war, misery, suffering and poverty. As one 12-year-old girl wrote, “I don’t understand why God is allowing all this. Therefore I don’t believe in God.”



[caption for figure 13] Percentages of Abstract Images Drawn by Religious and Nonreligious Children. As religious children grow older, their depictions of God become more abstract, reaching 80% by the age of 16. Only 20% of the pictures drawn by older nonreligious children were abstract; 80% remained anthropomorphic.

### Imagining God

Children do not have the cognitive skills to articulate abstract concepts of God, but they can use their visual imagination to comprehend spiritual realms. Even in the adult brain, ideas appear to be associated with internal visual processes, and mathematicians often think in pictures when they describe the invisible forces of the universe. Even when we imagine the distant past or future events, we activate the visual-spatial circuits in the brain.<sup>81</sup> In fact, if you cannot see, hear, touch, taste, or smell something, the brain’s first impulse is to assume that it doesn’t really exist. Thus, for anyone, it is neurologically difficult *not* to give God an image.

Without this capacity for visual imagination, we would barely be able to think. Even when we sleep, our visual representations of the universe remain active, albeit in unusual ways. Children, however, do not have the neural capacity to easily separate fantasy from fact, and so they form beliefs that blur the boundaries of reality. They easily believe that their nightmares are real, but adults have advanced neural processes to help them analyze perceptual discrepancies.

The imaginations of children run wild, and this makes it easy for them to define God with simple pictures and words. Furthermore, the ways that they hear adults talk about God will



contribute to the images they form. For example, if you tell a child that God can see you, or listen to your prayers, then the child's imagination will associate those qualities with the eyes and ears of a face. If you tell that same child that God gets angry, the brain will generate images of frowns, gritted teeth, or perhaps fists banging against a wall—visual constructions that represent how a child perceives anger in other human beings. If you tell your child that God can perform miracles, then the internal imagery takes on super-human traits. For example, one boy drew God with a cape and a large “S” on his chest.

Girls, by the way, draw somewhat different pictures than boys. They tended to use more symbolic and abstract representations, and in Hanisch's study, a small percentage of 7-year-olds drew female representations of God. Neurologically, we know that males and females process emotional words in different ways, and in different parts of the brain and this may explain the subtle differences.<sup>82</sup>

Slowly, a concept of an anthropomorphic deity evolves in the child's brain. As the brain begins to make the neural connections needed for abstract reasoning, religious images become more abstract. Yet abstract concepts will still be visually processed. Thus a notion like love or compassion—which has no physical form in the world—will be drawn as heart or a hand reaching out to another. Happiness may be drawn as a smile, guilt or shame may be represented through the use of dark colors, and an all-powerful benevolence might be drawn as sun radiating down on the Earth. But when it comes to our most primal sense of God, it all begins with a face.

### **God is a Noun**

We are born with a neurological mechanism to identify objects, and the first objects that infants learn to identify are their family and caretakers. With each new object that a child learns to recognize, the brain labels it, the first of many steps that turn an image into a concept and a word. Thus, the first words that infants speak are those that identify the people who they see.<sup>83</sup> But the only part of the person that an infant recognizes is the face.

Young children can only grasp the simplest concepts because the neurological capacity to comprehend abstract concepts won't mature until adolescence.<sup>84</sup> The easiest type of word for children to learn is a concrete noun because it refers to something that the child can see, touch, or taste.<sup>85</sup> Young children cannot understand words like peace or democracy because these are highly sophisticated ideas, and the places in the brain where abstract nouns are processed remain poorly developed for many years. A young child's brain has no choice but to visualize God as face that is located somewhere in the seeable physical world, and this is what we find when we analyze the pictures drawn by children younger than ten.

Brain-scan studies show that nouns are linked primarily to visual object-processing regions.<sup>86</sup> Furthermore, each time that a novel idea is introduced, the brain responds with increased activity in specific areas of the right hemisphere,<sup>87</sup> in the same areas that construct our visual representations of reality. Thus, when a child is introduced to a spiritual concept, the brain automatically gives it a sense of realness and personal meaning. Children who continue religious education will be introduced to new ways of conceptualizing God, and each time that happens, the brain will revise its “spiritual” map, so it is not surprising to see children's pictures becoming more complex as they mature.

God is a noun, and nouns stimulate the “where” and “what” part of the brain, specifically regions in the parietal lobe.<sup>88</sup> This region is responsible for identifying and integrating shapes that it perceives in the world,<sup>89</sup> and from what we know about how the brain processes visual objects, we can assume that a child's parietal lobe is very active when thinking about the nature

of God. Thus, the brain attempts to place God somewhere within the physically observed universe. Thus, it might be less likely that children can feel a sense of unity with God at least purposefully. As our brain-scan research as shown, only advanced meditators can willfully suppresses activity in the parietal area.

However, older children may be able to alter the brain by shifting neurological attention from the visual centers to the frontal regions where abstract thinking takes place. Brain scan studies show that this occurs when adults focus on complex ideas, and when this happens, we neurologically disconnect from our visual orientation. This would allow God to lose his gender, face, and position in relationship to ourselves, and thus the boundaries “God” and “self” begin to blur or merge. As we will describe in the next few sections, some adult believers represented this spiritual experience by drawing mirrors to symbolize God and one’s self as being the same.

Mature frontal lobe processes are also responsible for the greater imagination, creativity, and originality that adults use when they attempt to describe the immaterial qualities of God. If these new ideas are repeated, old memory circuits can be permanently altered and changed. Still, our childhood notions of God will continue to influence our thoughts. This too is seen in adult pictures of God.

### **Examining Adult Pictures of God**

Based upon the changes reflected in children’s pictures of God, we reasoned that adult drawings should reflect similar developmental patterns. After all, neurological growth continues well into middle age—shouldn’t our concepts of God also mature?

To test this assumption, we set up our experiment to address the following issues. First, we presumed that adults who regularly attended church or engaged in spiritual activities would produce more abstract drawings than children would. Second, we presumed that the abstract drawings would be different in content and in meaning from those done by children. Third, we presumed that the majority of the drawings made by nonreligious adults and atheists would be anthropomorphic, reflecting little maturity or change. Our first two presumptions were right, but our presumptions about atheists were wrong.

Participants included congregational members from four different Religious Science churches, students from a community college, and members of a California Free-Thought/Atheist society. For our preliminary evaluation, we collected 231 pictures. Most of the college students were between the ages of 18 and 24, whereas the average age in the other groups was between 50 and 80, so we certainly had a wide range of adults we could analyze. More than half of these individuals had spent at least four decades seriously contemplating God, in both positive and negative ways.

### **Adult Believers**

160 of our survey participants were members of the Church of Religious Science (which is not to be confused with Christian Science), and most had been members for many decades. This spiritual group was founded in the early 20<sup>th</sup> Century by Ernest Holmes, and they subscribe to a New Thought philosophy that sees God, the universe, the mind, and one’s personal self as interconnected. As stated in the philosophical tenets of the United Church of Religious Science:

The Science of Mind is built on the theory that there is One Infinite Mind which of necessity includes all that is, whether it be the intelligence in man, the life in

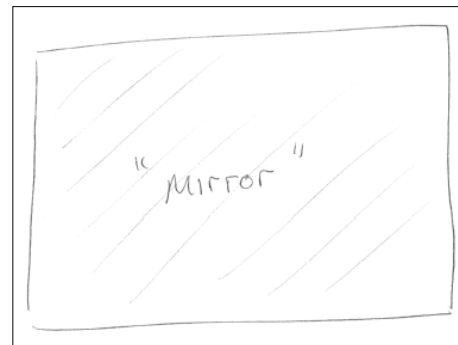
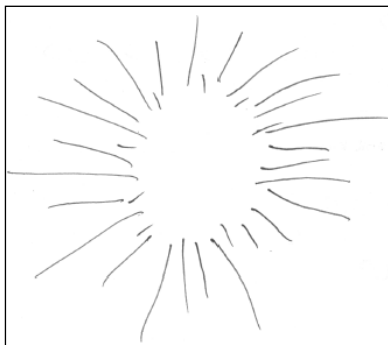
the animal, or the invisible Presence which is God. In it we learn to have a spiritual sense of things.<sup>90</sup>

In the tenets of Religious Science International (another of several institutes that are based on the principles established by Ernest Holmes), an emphasis is also placed on the value found in other religious traditions and sects:

Religious Scientists believe, very simply, that the Universe is fundamentally spiritual—it has intelligence, purpose, beauty and order. Whether we call it God, spirit, energy, or Universal Intelligence, every person, place and thing emanates from this spiritual universe. We believe this Universal Intelligence is within us, as well as around us, and that we are conscious of it. Our beliefs are in harmony with the basic tenets of all the world's great religions.<sup>91</sup>

As a group, I have found these congregations to be particularly optimistic about life, and they place great emphasis on the power of positive thinking to bring both spiritual and material prosperity into one's life. In addition to embracing contemporary psychological principles, they also attempt to integrate modern science and physics into their principles and beliefs.

As part of a workshop program that we have been introducing to religious institutes and public schools, we handed out a survey form on which we asked them to draw a picture of God. As we expected, faces and people appeared only 14% of the time, which was even less than the 20% found in Hanisch's religious 16-year-olds. This suggested to us that old anthropomorphic images continue to be neurologically revised as person's religious involvement continues. 86% drew a wide range of abstract designs, which, when you factor out the gender differences, was nearly the same as Hanisch's group. Similar to the findings in all of the other studies, nearly half of the abstract drawings were composed of suns, spirals, and radiating light. Approximately 10% drew nature scenes, 10% drew clouds, and 6% drew hearts, themes that were also common amongst the children of the earlier research studies. Unlike the children, there wasn't a single representation of a biblical theme, perhaps reflecting the non-biblical theology of the church.



**Drawing from a 22 year old woman who was raised Catholic (right), and a 72 year old man (left) who had been affiliated with Religious Science for 40 years.**

There was also a greater variety and complexity of abstract representations. Some people mixed animals with stars and crosses and suns, some drew arrows pointing in different directions, and a few represented God by drawing the symbol for infinity or an atom, with

electrons spinning around its core. Several members drew mirrors to capture the notion that God and self were reflections of each other, a belief that is integral in the teachings of Religious Science.

The words chosen to describe their pictures represented highly positive abstract concepts that few children used. For these people, God was energy, peace, freedom, and awareness—a blend of intellectual concepts and experiential senses similar to the descriptions we found in our online survey of spiritual experiences.

Another unique quality of “drawing” was captured, for 8% of the participants handed in of pages that were left completely blank. Often, they would add a comment stating that their picture symbolized “all,” “everything,” or “pure spirit.” With the exception of a few 18-year-olds, no children, to my knowledge, deliberately left their picture blank, nor did any child refer to God in similar abstract terms. These findings support our hypothesis that as the brain matures, the more you contemplate God, the abstract and mysterious God becomes.

For these members of the Church of Religious Science, God was a symbol for a transcendent level of consciousness. When this occurs, both words and pictures fail to capture the quality of the experience. The reality of God remains, but the concept becomes a metaphor for many personal and spiritual qualities of life. Such drawings also lend support for James Fowler’s model of faith development. His book, *Stages of Faith*,<sup>92</sup> is one of the most comprehensive models describing a person’s spiritual development over the course of a lifetime. He argued that if we deeply contemplate life’s meaning, our notions of God will evolve from concrete ideas to mythical beliefs, and from there toward more universal values of social responsibility.

Three of the Religious Science groups we surveyed were 90% Caucasian, living in middle-to-upper-class neighborhoods. The fourth congregation was 90% black, and the church was situated in a poorer inner-city neighborhood. However, the percentages of the different styles of drawing were the same, which meant that racial and socio-economic differences does not in the way one envisions God.

### **College Students**

The community college students in our study presented a very different profile, which was reflected in the ways they envisioned God. When asked what their current religious or spiritual orientation was, half wrote down that they were either religious or spiritual, but few were affiliated with an organization. The other half said they were either nonreligious, agnostic, or atheist.

But then we asked variety of questions that were designed to more accurately ascertain one’s degree of belief and disbelieve concerning God. We discovered that many of the religious and spiritual students also considered themselves agnostic, nonreligious, interfaith, or freethinker. Even those who considered themselves nonreligious would often select additional terms that could easily be interpreted as spiritual or religious. As we have pointed out before, it is very difficult to ascertain what a person’s religious beliefs are, and we believe that if you ask enough questions, you’ll find that most people simultaneously hold a multiplicity of seemingly discrepant beliefs. This was certainly true of our college student sample.

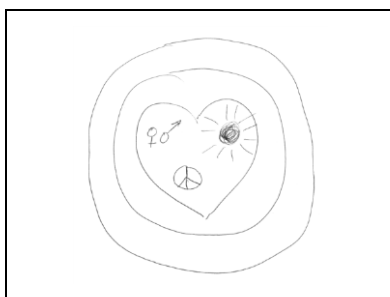
In fact, of all the categories chosen, the majority of students—both religious and nonreligious—identified themselves as freethinkers. Usually, the term is used by atheists and agnostics who reject all forms of institutionalized religious belief, but an informal query showed that these individuals did not like to identify themselves with any particular belief, especially

those represented by older members in society. In the literal sense, they saw themselves as thinking “freely,” willing to change their belief systems as they saw fit.

Does this imply that religious adolescents were more immature when it came to thinking about God? We think not. We know, for example, that religious interests rapidly decline during adolescence,<sup>93</sup> and that many teens will reject their parent’s values as they attempt to redefine their spiritual beliefs.<sup>94</sup> Indeed, for many people, religiosity continues to decline through the rest of life,<sup>95</sup> a trend that has continued since 1970.<sup>96</sup>

For the entire group, 20% drew faces and people, but only half of these people associated themselves with a denominational faith. The other half were agnostic. In fact, only one atheist drew a face, and even she said that she sometimes believes in God. Once again, we see a gradual decline in anthropomorphic representations, even among those who are disinclined to believe. In Hanisch’s study, 80% of the 16-year-old atheists continued to draw faces and people, but we found much lower representations among atheist college students. One reason for this discrepancy is obvious. Hanisch’s children were raised in an anti-religious culture that would not tolerate acceptance. American children are exposed to an extraordinary variety of religious beliefs, we know that variety stimulates neurological activity. Thus, American children are unconsciously encouraged to envision many possibilities of both God and godlessness.

Of the college students who drew faces and people, many said that their pictures represented the images they had as children. One Catholic-turned-Wiccan even drew a baby, saying, “When I was younger, I viewed God as child, like me—we were toys.” We also noted a high propensity of anthropomorphic representations from religious Catholics, but we’ll need to collect more data to see if this observation holds up.



**Drawing by an agnostic 19 year old female college student who saw God as a natural loving energy that was both male and female and which permeated the universe.**

63% of the entire group of students used a wide range of nature-based and abstract drawings: fields, trees, flowers, animals, suns, stars, planets, spirals, and other abstract forms. Some were particularly creative. For example, one person used musical notes to describe her uplifting feelings when she practiced yoga and meditation. A “questing” Catholic drew three overlapping faces—a man, woman, and a cat—to reflect the “multifaceted nature of God, and a self-proclaimed deist drew a clock to symbolize the timelessness of a spiritual universe. Again, this supports our argument that neurological development correlates with evolving conceptualizations of God.

In this larger second sample, we also had a high percentage—17%—of blank pages. Unlike the members of our church study, most of these students were nonreligious or agnostic.

For many, they simply said that if God doesn't exist, you can't draw a picture of God. Only a few people left the page blank to symbolize a mystical presence.

We asked our participants to write a brief description of their drawing, and most of the comments made by these "freethinking" students were positive. Many were neutral, but as the person moved closer to disbelief or atheism, negative comments increased. Those who expressed the strongest degrees of disbelief often used sarcasm in their drawings and commentaries. For example, one atheist said that God was Morgan Freeman, from the movie *Bruce Almighty*. Another drew a picture of the McDonalds' golden arches and wrote "Over One Billion Served." Then he crossed out the "Served" and wrote in "Saved." Such cynicism might be expected, since considerable research shows that older adolescents enter a period where they question and doubt religious beliefs.<sup>97</sup> Couple that with the usual irreverent tone of teenagers, and it is easy to see why such sarcasm might arise.

When we asked them about their initial reactions to drawing a picture of God, most expressed surprise. One student said, "I can't believe we're being asked this in a public school." Another said, "I knew it!" And one Catholic, who described her spiritual orientation as "lazy," actually shouted out, "Oh my God!" Many students said that they didn't have a clue what to do, but those who strongly disbelieved were either shocked or humored by the experiment. Interestingly, the more religious students had less resistance and negativity than the agnostics.

Perhaps most surprising, nearly everyone in the student survey expressed varying degrees of doubt concerning the existence of God, and even those who said they were atheist—which represented 12% of the sample—expressed doubts concerning their disbelief. In fact, 60% of those who circled "atheist" on the form to describe their orientation also circled "agnostic." Yet when they were asked the question, "Describe your current religious or spiritual orientation," many wrote down "unsure," "still certain," "disinterested," or other ambiguous terms.

I point this out to cast doubt on national polls showing that 70-80% of Americans are religious. Most surveys ask narrow questions or give limited choices, and this can taint the pollster's conclusions. Thus, I recommend that you even take our findings as suggestive, not definitive. With that caveat, I would say that our survey showed a much higher degree of agnosticism, at least among college students, than other studies have shown. Of those who considered themselves atheist (12%, by the way, is much higher than the reported 1-3% found in various American polls), only 1% said that they were certain that God did not exist.

If these young agnostics and ambivalent atheists hold on these perspectives as they grow older—and prior research as shown that they will—we may soon have a nation where 80% of the population will be questioning virtually every dimension of traditional religious belief. Given such a scenario, I can barely imagine what types of spiritual communities will be born. But given the history of American religion, I'm sure it will rise to the task.

### **Adult Nonbelievers**

Here's where the real surprise came in. Of the 23 members of the Freethinker society—all of which expressed, only 20% drew people and faces, far less than those drawn by the "freethinking" college students and the East German children described above. In fact, the quantity of anthropomorphic representations of God was only 5-7% higher than what we found in the members from the Church of Religious Science. But that's where the similarities end.

50% of adult atheists left their pictures blank, compared with 8% of the church attendants and 17% of the agnostic college students (only one atheist student left her picture blank). In addition, 50% of the adult nonbelievers refused to make any comments about God in the space

that was provided on the form. And yet, there was far less hostility than what we found with our atheist/agnostic college students, or what Hanisch found with his East German children. Instead, the comments were mostly neutral. A few intimated that God was equivalent to beauty, energy, and the unknown, but most saw God as an outdated idea reflecting biblical notions of a powerful immortal being. For these individuals, God imbued no personal meaning to their lives.

### **The Pictorial Meaning of God**

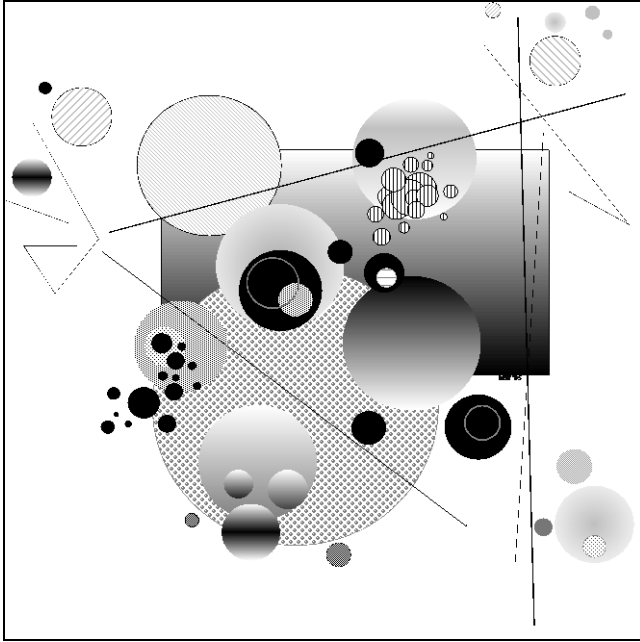
Our ongoing research continues to demonstrate that all human beings develop multiple images of God, many of which are largely hidden from consciousness. Yet these images affect the way we think and feel. We also believe that asking people to “draw a picture of God” encourages children and adults to articulate spiritual values and concerns that are often difficult to convey. It’s a fun exercise to do in classrooms, churches, and family gatherings, and it generates the kinds of conversations that help people of all persuasions to appreciate the wide differences of religious and spiritual beliefs.

Drawing is a form of communication that is neurologically distinct from writing and speech.<sup>98</sup> Whereas writing involves the abstract functioning of language centers in the left hemisphere, drawing involves the language centers of the right hemisphere, where meaning is ultimately processed.<sup>99</sup> In essence, words and pictures are two integrated elements of language, and most words, as I mentioned earlier, have an “image” quality associated with them.<sup>100</sup> If the right hemisphere is injured, words and pictures lose their meaning. Thus, to have a comprehensive concept of God, the brain needs to integrate abstract associations with image-associated metaphors and feelings. Words are not enough to describe a spiritual experience, but the combination of words and pictures may actually come closer to representing one’s individual relationship with God.

Overall, we found that atheists were either highly creative or highly unimaginative when it came to drawing pictures of God. For those who simply lost interest in God, only childhood images were recalled—usually the old man with a beard—but those who seriously contemplated their doubts often used sophisticated symbolism to represent their feelings and thoughts. For example, a leader of a national freethinker group sent me a beautiful four-color mandala made out of concentric circles within circles. Although she does not believe in God, she wrote that her drawing reflected the elements of nature, which she worshipped in much the same way that a religious person worships God. For her, nature was a source of revelation in much the same way that the universe was a source of revelation for Einstein.<sup>101</sup>

Another leader of an atheist/human-rights organization sent me a picture of a famous optical illusion, similar to the drawings made by the illustrator M.C. Escher, to express her view of religious beliefs. This 80 year old woman wrote: “When you first look at it, it seems to make sense, but when you examine it closely, it makes no sense at all. It has no real-world application.”

In this drawing by a male atheist who regularly meditates, the overlapping circles represent the transcendent nature of a universe governed by the laws of time, space, and quantum mechanics. The tiny black circles represent different religious traditions, the intersecting lines symbolize human consciousness, and the small square in the upper right-hand corner represents “man’s conception of God.” For this individual, God is much smaller than the forces that govern a “non-self creating universe.”



**Drawing by a 40 year old male atheist who had spontaneous mystical and transcendent experiences**

Circles, as I noted earlier, are one of the most common themes used to represent spirituality by religious adolescents and adults. Interestingly, intersecting circles, colors, and triangles were often used by abstract painters like Kandinsky to represent the spiritual nature of the world:

Modern artists are beginning to realize their social duties. They are the spiritual teachers of the world.... Every man who steeps himself in the spiritual possibilities of his art is a valuable helper in the building of the spiritual pyramid which will some day reach to heaven....A yellow triangle, a blue circle, a green square, or a green triangle, a yellow circle, a blue square--all these are different and have different spiritual values.<sup>102</sup>

In every child, and perhaps every adult, there is an artist that is capable of reaching out beyond the confines of a limited human mind to touch some deeper essence of life. So wherever you turn, and whomever you ask, it appears as though everyone has some image of God, even if it is represented by nothing other than a blank sheet of paper. To a neuroscientist, this suggests that believers and disbelievers may harbor a “God neuron” or a “God circuit” somewhere inside the brain. For one individual, such a neuron might connect with feelings of pleasure and awe, but for another, to feelings of disappointment or pain. There may even be people who lack the neural circuitry to construct either a positive or negative image of God. Instead, they must find meaning and purpose somewhere else.

### **Is There a God Neuron in *Your* Brain?**

In a recent neuroimaging study published in *Nature*, researchers demonstrated that a single neuron in an individual’s brain would only fire when the person was shown a well-



recognized face.<sup>103</sup> They implanted electrodes in several epileptic patient's brains prior to surgery, and each was shown a large number of photographs of people, places, and objects. For one patient, a single neuron fired to images of Jennifer Aniston, and nothing else. For another, a neuron responded when the patient was shown a picture or a drawing of Halle Berry, the actress who played the role of Catwoman in a Hollywood film.

In a previous study, the same team found an individual who had a single neuron that would fire to Bill Clinton. Another patient's neuron responded to images of the Beatles. The researchers also discovered that individual neurons will fire selectively to images of animals, buildings, or scenes. Thus, it is possible for some people to have a single neuron that will only fire when they see a familiar image of Jesus, a sitting Buddha, or the Jewish star of David. That neuron could represent the cornerstone of their religious training and belief.

Is it possible that some people could have a neuron, or specific set of neurons, that would fire when they are asked to envision God? Yes, but it would probably be associated with the image they were introduced to in early childhood. For many people, that neuron might be associated with one of the most famous paintings in the world: the image portrayed by Michelangelo on the ceiling of the Sistine Chapel (which, by the way, is very similar to ancient pictures of Zeus). This God—that wise, compassionate, and powerful man with the long white beard and flowing robe—is the image that remains imprinted in my mind.

Today, my memory circuits of God have entwined themselves with my neurological research and childhood beliefs. And the same thing happens in every person's brain. We all begin with a simple neural circuit that captures our earliest impressions of God, and as we associate new meanings and qualities, these circuits interconnect, becoming larger and more complex over time.

As brain-scan technology becomes more refined, I suspect that we will see that each human being has a unique neural fingerprint that represents his or her image of God. The East German students were not encouraged to contemplate religious beliefs, so their neurological sense of God included little more than a primitive image of a face, one that was fused with the negative messages that they were taught. But Religious Science congregants transformed their childhood images in ways that attempted to include the totality of life. For them, God, thoughts, the universe, and an optimistic view of one's self have all been fused together into a vast interconnecting web of neurons that can influence nearly every aspect of one's life. And for people who choose to meditate, they create a different neural network based upon the images and thoughts they contemplate.

### **Envisioning Transcendence**

For the genuine mystic, God transcends every concept that the brain can possibly generate. But what happens in such a brain? What happens when you go against your biological propensity to turn God into an image? At first, your brain rebels. It doesn't like uncertainty, and when it encounters a problem that appears to be impossible to solve, it releases a lot of neurotransmitters that puts you on alert. You'll feel an odd combination of anxiety, curiosity, irritability, frustration, and excitement—all the feelings that stress chemicals trigger in your brain. And if you don't find a solution, you could easily end up depressed. In religious circles, this is called the dark night of the soul.

Those who embrace a mystical vision of God rarely suffer psychological angst for extended periods of time. Instead, they find new ways to make sense out of the unimaginable realms to which they feel drawn. This indeed is a creative process, which means that they have

interrupted habitual patterns of thinking. Instead, like a child, they allow their minds to fantasize and speculate, and in the process new neural connections are made that allow a person to integrate the old and new perspectives. Artists, inventors, and theoretical scientists do this all the time, and so do theologians. And for these people, there is nothing more gratifying than looking at the world with new eyes. New images are formed, and if they prove useful to others, the old images will be dismissed.

Based upon the research we have presented in this book, we believe that the more you examine your spiritual beliefs, the more your experience of God will change. And if you cannot change your image of God, you may have trouble tolerating people who hold different images of God, and that may threaten our planet's survival. In the words of the religious philosopher Martin Buber: [Is excerpt taken from full-length book? Yes]

Time after time, the images must be broken . . . [for it] is the human soul which rebels against having an image that can no longer be believed in, elevated above the heads of humanity as a thing that demands to be worshipped. In our longing for a god, we try again and again to set up a greater, more genuine and more just image, which is intended to be more glorious than the last and only proves more unsatisfactory. The commandment, "Thou shalt not make unto thee an image," means at the same time, "Thou canst not make an image." This does not, of course, refer merely to sculptured or painted images, but to our fantasy, to all the power of our imagination as well. But we are forced time and again to make images and forced to destroy them when we realize that we have not succeeded. The images topple, but the voice is never silenced."<sup>104</sup>

From a neurological perspective, images of God are unavoidable, but from many theological perspectives, there is no true image of God. Thus, if you cling to your childhood perceptions, you will limit your perception of truth. This is the drawback to any religion that insists upon a literal, biblical image of God. If you limit your vision, you might feel threatened by those who are driven to explore new spiritual values and truths. And those people might turn out to be our future leaders and saints.

### **The Self-Evolving Brain**

The neural evolution of God is unavoidable in all human beings, but not in the Darwinian sense of the word. Human beliefs are not tied to the principles that govern genetic evolution,<sup>105</sup> and thus we are free re-invent ourselves, and our spirituality, with every new generation.

What makes human beings unique is the extraordinary impermanence of their ideas, and this impermanence is reflected in our extraordinary neuroplasticity. Neurons do not have fixed properties. Instead, they are changing all the time.<sup>106</sup> It takes less than two weeks for a neuron to grow new axons and dendrites,<sup>107</sup> and in some cases, the change occurs suddenly.<sup>108</sup> Competitive behavior,<sup>109</sup> environmental influences,<sup>110</sup> education,<sup>111</sup> or even a rousing sermon can trigger a rapid rewiring of circuits. In essence, evolution gave us a nervous system that actively participates in its own neural construction, something that we do not see in other animal brains.

It even appears that our brain has a mutant strand of DNA that contributes to our creativity, inventiveness, and individual uniqueness. These "jumping genes," as scientists are fond of calling them, can cause cells to change their functioning as we grow.<sup>112</sup> This explains why identical twins are not really identical, why one family member can be brilliant at math

while another excels at sports, or why one relative ends up struggling with a serious mental illness when no other family member has any semblance of a problem. No two people perceive the world, or God, in the same way, because no two human brains begin with the same genetic code.

Terrance Deacon, the esteemed professor of anthropology and neuroscience at the University of California in Berkeley, describes the human brain as an “evolutionary anomaly” because human beings have unparalleled cognitive abilities to imagine the unimaginable:

We think differently from all other creature on earth, and we can share those thoughts with one another in ways that no other species even approaches .... We alone brood about what didn't happen, and spend a large part of each day musing about the way things could have been if events had transpired differently. And we alone ponder what it will be like not to be ... No other species on earth seems able to follow us into this miraculous place.<sup>113</sup>

We live most of our lives in a world filled with imaginative thoughts, and as we age, we continually modify our beliefs. We are born anew, as the evangelicals like to say, and we can do it as often as we like. We can change our religion, we can change our moral code, and we can change our pictures of God, thanks to the evolution of a truly unusual brain.

## Chapter 7

### **What Happens When God Gets Mad? Anger, Fear, and the Fundamentalist in Our Brain**

As we have argued throughout this book, most Americans have greatly benefited from their personal relationships with religion, spirituality, and God. But when it comes to sharing our religious beliefs with others, certain problems may arise, especially if we desire that the other person embrace our spiritual points of view. If we use our powers of persuasion to reach a general consensus of belief—which from an evolutionary point of view, is essential for social cooperation—we are bound to create conflicts with those who hold different religious beliefs.

The culprit is not religion per se, but what our brain is biologically inclined to do when we encounter people who embrace different visions of “truth.” One part wants to reject opposing ideas, while another part tries to understand, cooperate, and compromise. In essence, we all have two brains—one that is selfish and suspicious, and another that is open-minded and kind. Since we live in a world that is filled with uncertainties, both brains are constantly on the alert.

#### **The Two Wolves**

Once upon a time, or so the Cherokee legend goes, a young Indian boy received a beautiful hunting knife as a gift. When his best friend saw it, he asked if he could play with it,

but the boy felt torn. He didn't want to share his new present, so he angrily told his friend, "No!" His friend ran away, and the boy sat down on a rock by the stream to contemplate his dilemma. He hated the fact that he had hurt his friend's feelings, but the knife was too precious to share. In his guilt, he went to his grandfather for advice.

The elder listened quietly, and then replied. "I often feel as though there are two wolves fighting inside me. One is mean and greedy and full of arrogance and pride, but the other is peaceful and generous. All the time they are struggling, and you, my boy, have those same two wolves inside of you."

"Which one will win?" asked the boy.

The elder smiled and said, "The one you feed."

We all harbor a pack of neurological wolves in our brain. The old ones reside in the limbic system, and they are filled with aggression and fear. They're fast, efficient, and potentially deadly, and they've been running the show for 150 million years. The younger ones reside in our frontal lobes, where empathy, reason, logic, and compassion reside. These pups are playful and imaginative, but they are also neurologically vulnerable and slow when compared to the activity in the emotional parts of the brain.

So, when it comes to making sophisticated moral decisions, which one will win? The selfish, frightened brain, or the cooperative one? Again, as with the two wolves, it depends on the one you feed. If you allow anger and fear to dominate, you will lose the neurological ability to think logically and act compassionately toward others. In fact, it is nearly impossible to find peace and serenity if your mind is preoccupied by negative, anxious, or hateful thoughts.

Excessive anger or fear can permanently disrupt many structures and functions in both your body and your brain. These destructive emotions interfere with memory storage and cognitive accuracy, which, in turn, will disrupt our ability to properly evaluate and respond to social situations.<sup>114</sup> Anger makes people indiscriminately punitive, blameful, pessimistic, and unilaterally careless in their logic and reasoning skills.<sup>115</sup> Furthermore, anger encourages your brain to defend your beliefs—be they right or wrong—and when this happens, you'll be more likely to feel prejudice toward others.<sup>116</sup> You'll inaccurately perceive anger in other people's faces,<sup>117</sup> and this will increase your own distrust and fear. It's an insidious process that feeds on itself, and it can influence your behavior for very long periods of time.<sup>118</sup> Eventually, it will even damage important structures in your brain.

Nor is it good for your heart. Regardless of your age, gender, or ethnicity, anger, cynicism, hostility and defensiveness will increase your risk of cardiovascular disease and cerebrovascular problems.<sup>119</sup> What makes anger particularly dangerous is that it blinds you to the fact that you're even angry; thus it gives you a false sense of certainty, confidence, and optimism.<sup>120</sup>

When people use their religion or politics—or even humor or teasing<sup>121</sup>—as a weapon to aggressively disparage others who embrace different beliefs, they unwittingly stimulate the other person's brain to retaliate with similar aggression. Aggression and hostility shuts down activity in the anterior cingulate and striatum—which are the two key elements of the brain that control anger and fear—and when this occurs, the amygdala takes over, generating a "fight-or-flight" response that is spread through every other part of the brain.<sup>122</sup>

In fact, brain-scan evidence suggests that you won't even be able to read this chapter without having some of your "limbic buttons" pushed, because the moment the brain hears or sees words that have a negative meaning, your amygdala goes on the alert.<sup>123</sup> Words like "anger," "fear," "selfish," "danger," and "punish"—which are used more than fifty times in this

chapter—are neurologically unpleasant, whereas emotionally positive words like “love,” “compassion,” and “trust” activate the striatum and other parts of the brain that are related to pleasure, happiness, peace, and the sense of impending reward.<sup>124</sup> In this chapter, we’ll be addressing the positive and negative aspects of “fundamentalism,” but because the word has become so closely associated with authoritarianism, right-wing conservatism, and terrorism, it is virtually impossible to talk about this important societal issue without stirring up feelings of discomfort.

### **Selfishness and Morality**

As we reported in detail in our previous book, a tremendous amount of research points to the fact that we are born with a selfish brain, and that when given a choice, we have a biological tendency to act in self-serving ways, especially if no one is watching.<sup>125</sup> Children do not know how to behave morally because their brain has not developed the cognitive skills to comprehend abstract ethical principles. And as every parent has learned, different degrees of punishment are needed to train young brains to follow societal rules. In fact, from the perspective of evolutionary biology, it appears that social forms of punishment enhance most people’s propensity to behave in altruistic ways.<sup>126</sup>

Not only are we neurologically inclined to act selfishly, but we are also neurologically equipped to detect acts of selfishness and deceit in others.<sup>127</sup> When we do, we unconsciously react in a punitive, authoritarian manner. Even when adults play games, if they sense that their partner is being overly aggressive or unfair, they will react more punitively, with less compassion.<sup>128</sup> Indeed, a balanced combination of punishment and reward tends to foster cooperation between individuals and groups. As a recent article in *Science* explains:

Research indicates that strong reciprocity—the combination of altruistic punishment and altruistic rewarding—has been crucial in the evolution of human cooperation. People often reward others for cooperative, norm-abiding behaviors, and they punish violations of social norms. For thousands of years, human societies did not have the modern institutions of law enforcement—impartial police and impartial judges that ensure the punishment of norm violations such as cheating in an economic exchange, for example. Thus, social norms had to be enforced by other measures.<sup>129</sup>

One such measure was the institutionalization of religion, which, for centuries, has struggled with ways to promote group coherence by demoting socially destructive behaviors. Thus, it is not surprising to find that the “Two Wolves” tale has been used as a metaphor by different religious groups.<sup>130</sup> For example, a young Southern Baptist pastor named John Bisagno used it to describe a spiritual struggle that went on in the heart of a Native American who had been converted to Christianity:

At the instant of conversion God places into our being an entirely new nature, His own nature. Now we possess two natures—the old and the new, the carnal and the spiritual, the flesh and the spirit. . . . An old missionary returned to the home of a convert among the Mohawk Indians. When the missionary asked him how he was doing, old Joe said, “Well, it seems that I have a black dog and a white dog inside of me and they are always fighting.” The missionary asked him, “Which one

wins?” and Joe said, “The one I feed the most.” Our daily fellowship with God is determined by which nature we feed the most.<sup>131</sup>

The tale illuminates a person’s inner struggle between spiritual and physical pleasures, and Billy Graham used a version to portray “the inner warfare that comes into the life of a person who is born again.”<sup>132</sup> Bisagno and Graham intuitively identified the neurological struggle that exists any time we attempt to embrace higher ethical principles and ideals. However, if a person dwells obsessively on the inner warfare, he or she can do as much damage to the brain as a lifetime of alcoholism or drugs.<sup>133</sup>

### **Taming Your Selfish Brain**

We all begin life with a biological propensity for selfishness, and evidence shows that we rarely, if ever, completely abandon these traits. We may suspend them temporarily in order to get along with others, but even then, altruism frequently appears to be a by-product of mutually satisfying each individual’s personal desires.<sup>134</sup> In one intriguing experiment, subjects were asked to assign two jobs, one to themselves, and another to a participant who they could not see. One task was interesting, and offered a financial incentive, but the other was boring and offered no reward. Most individuals chose the beneficial task for themselves. Another set of participants were told that they could flip a coin to help with the decision-making process. Half used the coin, but the majority still assigned themselves the more enjoyable job, even when the coin toss went against them. However, when a mirror was placed in front of those making the assignment, they acted more fairly.<sup>135</sup>

Perhaps they did so out of guilt, or because they were reminded that another real person was involved. Interestingly, when researchers at the University of British Columbia introduced the concept of God during a simulated competition or “trust” game, participants—whether they are religious or not—acted far more generously toward their opponent.<sup>136</sup> Clearly, spiritual incentives can induce people to act morally, but the researchers found that thoughts or images of police or civic authorities also increased generosity. This study does lend credence to the notion that authoritarian concepts can help to tame the uncooperative “wolves” in society, which may explain why most ancient religions were filled with punitive gods and rules. But there is fine line that needs to be walked, for as I mentioned earlier, too much focus on the negative can lead to anxiety and fear.

Young children have a particularly difficult time with stories describing God’s anger. For example, we know that nightmares are directly related to a child’s reaction toward frightening images and hostile words,<sup>137</sup> and we know that images of a punitive and authoritarian God increases children’s anxiety, not just in Christians, but in Muslim children as well. In a study conducted in the United Arab Emirates, psychiatrists explored the prevalence of fear in 340 adolescents. Of the sixty fear items listed, belief in the devil and fear of breaking a religious law evoked extremely negative reactions in fifty percent of the subjects. According to the researchers, “Nearly half of the children reported that the fear caused considerable distress and interfered with daily activities.”<sup>138</sup>

How do we find the “right” balance between punishment and reward? It is a question that has never been satisfactorily answered from either a psychological or theological perspective. Nor has anyone been able to conclusively show that religion strengthens moral convictions. For example, one study found no relationship between honesty and religiosity,<sup>139</sup> while another study found that students associated with religious organizations were more academically dishonest

than those who practiced spirituality on their own.<sup>140</sup> And although many individuals believe that their conversion to a deeper religious life helped them to abandon destructive behaviors, one study found that “saved” men were just as likely as “unsaved” men to read pornography and abuse their wives.<sup>141</sup>

So is there something more definitive that we can do to tame our selfish brain? Neurologically, the answer is surprisingly simple, because all we need to do is consciously exercise kindness and fairness toward others. As many studies have shown, the more compassionate we become, the more generous those around us become.<sup>142</sup> And when we perceive others as being sensitive to our needs, our brains respond with greater generosity, a condition known as reciprocal altruism.<sup>143</sup> This is the phenomenon we casually refer to as “you scratch my back, and I’ll scratch yours.” Thus, when we treat others with kindness and respect, even those who hold different beliefs will respond in kind. An upward spiral is created that strengthens the anterior cingulate, a crucial part of the true heart and soul of the brain. As neuroscientists at the University of California in Los Angeles point out, activation of anterior cingulate and prefrontal cortex “reflect the active suppression of unwanted racial biases.”<sup>144</sup>

We live in a pluralistic society, and this is enough to trigger a biological response toward prejudice, but research has shown that those who consciously strive toward embracing pluralism and a diversity of beliefs tend to treat others with greater equality, fairness and generosity.<sup>145</sup> In fact, many studies have demonstrated that the more friendly contact you have with members of different religious, cultural, ethnic, and racial groups, the less prejudice you will harbor in your brain.<sup>146</sup>

Research has also shown that when people embrace egalitarian beliefs, they become less authoritarian in behavior.<sup>147</sup> It even appears that human beings have a biological and evolutionary drive towards creating equality between competing groups and individuals,<sup>148</sup> and when equality is established, cooperation improves.<sup>149</sup> This, indeed, provides a foundation of hope when dealing with the overwhelming number of conflicts that currently involve many nations throughout the world.

### **An “Us-Versus-Them” Mentality**

Although we can train ourselves to be less prejudiced and more accepting of others, we will still harbor elements of an exclusivist mentality deep within our brain, dismissing the relevance of other people’s beliefs. In fact, we are all biased toward perceiving our own beliefs as true, even when the evidence clearly contradicts our points of view. For example, in a study assessing how religious and nonreligious students evaluate the beliefs of the other group, both groups tended to see the other side as illogical, yet they failed to see the illogic in their own perspectives and beliefs.<sup>150</sup> In other words, our minds are always biased toward seeing evidence that only supports our point of view. To put it another way, our brain has a preference for consistency, and this is what helps us to maintain our systems of belief.

Our brain automatically places objects and people into separate, distinguishable groups, and then we select a preference for one group over the other. We will root for our favorite baseball team, and disparage the challenging team, and we will tend to distrust whatever the opposing political party says. The same holds true for anyone we perceive as being a member of a “different” group—be it religious, political, or ethnic—and when we do this, the tendency is to treat the other group unfairly. As many studies have confirmed, the “in” group will always orchestrate scenarios that are less than favorable for any “out” group.<sup>151</sup> In-group morality is also associated with intergroup conflict<sup>152</sup>

An “us-versus-them” mentality exists even when the division is arbitrarily assigned in an experiment or game. When individuals were randomly placed into different groups, they felt stronger about their own group and tended to feel negatively about other groups, even when issues of religion, sexual identity, and culture were factored out.<sup>153</sup> In other words, simply being a part of a group results in feelings of ill will towards others, and this evokes the desire to isolate one’s self from them.

But there is a simple solution. As Princeton University professor Susan Fiske explains, if you want to decrease your natural tendency toward prejudice and out-group bias, don’t “categorize” yourself. People, she states, can get beyond—and even prevent—“their automatic use of category-driven impression formation and decision making.”<sup>154</sup> You’ll do your brain, and society, a lot of good if you don’t identify yourself as a Christian, Muslim, Jew, or atheist. Even labels like “Democrat,” “Republican,” or “American” can trigger an unconscious “us-versus-them” mentality in your brain.

Brain scan studies have helped document the inherent biology of exclusive thinking as it relates to the balance of the limbic system and frontal lobes. One study showed that when we see someone who is a member of a different racial group, our brain reacts with fear in a matter of seconds.<sup>155</sup> Fortunately, we can train ourselves to override this prejudicial nature of the brain, but it again requires a conscious commitment to show tolerance and compassion for others.<sup>156</sup>

Thus, we always have a choice. We can be driven by our negative emotions of the limbic system, or we can tilt the balance towards the compassion of the frontal lobes. Children, too have the beginnings of both wolves, and therefore, have a biological propensity to exclude other children who fall into a minority group. However, when they are placed in a mixed cultural group and given a project that requires everyone’s assistance, prejudices fall away, hostility fades, and group cooperation flourishes.<sup>157</sup>

### **Fundamentalism and Anger**

Although nearly one third of Americans consider themselves Christian fundamentalists,<sup>158</sup> it is probably the least understood form of religiosity, even by those who are members of fundamentalist congregations. Nor is there a simple definition of fundamentalism. To address the many dimensions of the world’s fundamentalisms, University of Chicago professors Martin Marty and Scott Appleby directed a multiyear interdisciplinary study, called the Fundamentalism Project that culminated in the publication of 5 encyclopedic books on the topic.<sup>159</sup> As a way of generalizing the numerous forms of fundamentalisms and fundamentalist-like movements, the hundreds of experts considered that fundamentalists rely on strict interpretations of their sacred texts. Fundamentalisms usually emerge from conservative, traditional, or orthodox religious cultures and people in such cultures usually feel threatened by what they see as the modern erosion of traditional values and beliefs. In addition, they sometimes feel that they must take vigorous action against those who disagree.

Other scholars have pointed out that fundamentalism is not a unitary religious tradition, and that there is a wide range of interpretations within fundamentalist traditions. Some are peaceful and serene while others are hostile and militant. Thus, there are both positive and negative sides to fundamentalism, but overall, it represents a very personal and complex meaning system for the believer.<sup>160</sup>

On an individual level, strong religious identification appears to have a beneficial effect on one’s health, for as several studies have shown, as religious convictions increase, anxiety and



depression tend to decrease.<sup>161</sup> Even in Iran, higher degrees of religiosity among medical students are associated with lower degrees of anxiety.<sup>162</sup> People feel comforted by strong beliefs because it gives them an unambiguous understanding of the world. And within the fundamentalist community, there exists a strong sense of social support. However, family emotional support in general has been shown to be more effective than religion in helping individuals cope with anxiety.<sup>163</sup>

As we see it, the neurological problem of fundamentalism does not lie in the firm adherence to a specific set of beliefs. Rather, the problem arises when individuals use their religion to justify angry feelings toward others. Specifically, expressing or listening to angry thoughts can disturb the normal neural functioning of many parts of the brain. In fact, just reading emotionally evocative words stimulates the amygdala and hippocampus in ways that resemble the encoding of traumatic memories.<sup>164</sup>

When you listen to angry speech—in a congregation or political forum—specific parts of your brain begin to mirror the angry content of the speaker.<sup>165</sup> All you have to do is see a harsh, angry, or contemptuous face in a picture, and the same neural reaction will be triggered<sup>166</sup> because the human amygdala is particularly responsive to the emotional expressions on other people's faces.<sup>167</sup> And the stronger the expression, the stronger your emotional reaction will be.<sup>168</sup>

Even watching violence on the news, or taking in a violent movie, will make you feel more angry, aggressive, negative, and powerless.<sup>169</sup> And the same thing happens in your brain when you listen to songs with hostile lyrics,<sup>170</sup> even if they are presented in a humorous way.<sup>171</sup> Furthermore, a meta-analytic review of video-game research found that “violent video games increase aggressive behavior in children and young adults.”<sup>172</sup> According to University of Iowa researcher Craig Anderson, “the deleterious effects on behaviour, cognition, and affect” are directly linked to “serious, real-world types of aggression.”<sup>173</sup> No matter how you look at it, exposure to, or expression of, any form of anger is hazardous, not only to the health of the individual, but to society as well.

Unfortunately, as far as the brain is concerned, negative speech has a stronger effect than positive speech.<sup>174</sup> Negative remarks and memories are more strongly encoded in the brain, and they are the most difficult memories to eradicate. In fact, simply being around negative people will make you more prejudiced, because listening to negative opinions can easily undermine your positive opinions about virtually anything.<sup>175</sup>

In essence, our brains are designed to mimic the emotional expressions of others.<sup>176</sup> Not only does this allow us to feel what others feel, but it causes what is known as emotional contagion, a universal neurological process whereby subjective feelings are transferred to other people and spread through social groups.<sup>177</sup> So how fast does it take the brain to respond to another person's emotion? When you see an angry expression, it takes less than one second for your brain to respond with fear.<sup>178</sup>

### **Responding to Anger with Compassion**

So how do we deal with someone who persistently uses angry rhetoric to try to change your religious beliefs? One solution is to walk away, the other is to try compassion. The closest I came to being in such a situation was when I was dating a girl in high school whose family were strong fundamentalists. The family believed in the literal interpretation of the bible, and since I did not follow their doctrines, I was going to end up in hell. They continuously bombarded me with statements and arguments about why they were right and I was wrong. Sometimes the

exchanges became quite heated and even though we strongly disagreed with each other, we did try to keep the dialogue going.

As an impressionable teenager, I found this experience fascinating, but disturbing. I tried to challenge their beliefs—to no avail—but I was always respectful, and in the process, I learned a great deal about my own personal values and beliefs. I once asked them how they would respond if an alien family from another world came to visit Earth. “If they looked at every religion,” I said, “they would find that each one had its own sacred books, sacred songs, and sacred truths. How would they know what religion to choose?” My girlfriend’s family acknowledged that the alien would have a very tough time—that it was ultimately a leap of faith. And perhaps that is something we all need to remember. No matter what our beliefs are, our brain is making a leap of faith.

Because I showed an openness to their ideas, they treated me with respect, and I came away from the experience knowing that this was an essential element when dealing with people who hold fundamentally different beliefs. I also wondered whether it was ever possible to easily alter someone’s way of thinking, especially if he or she was a “true” believer. It is a question I have pondered for decades, and the short answer is, “No.” From a neurological perspective, the more we immerse ourselves in a specific ideology, the more the brain responds to that belief as if it were objectively real. Thus, there is no simple technique, or drug, that will change a person’s fundamental beliefs.

The same holds true when dealing with angry people. It is difficult to do, but if we can show compassion for their underlying suffering and pain, their brains will resonate to our kindness. In fact, research has shown that highly empathic people are more likely to respond to angry expression by smiling.<sup>179</sup> Angry people, however, do not have this ability. In fact, highly aggressive people automatically assume that other people will react to them with anger, and thus they will become even more aggressive, even though no hostility toward them was returned.<sup>180</sup>

In the battle between two wolves, the one who refuses to fight will often walk away unscathed. And as considerable meditation research has shown, people who maintain a mindful state of acceptance tend to have better relationships with others.<sup>181</sup> Thus, when we train ourselves to be empathic, interpersonal animosity declines.<sup>182</sup> We’ll explore this principle in greater depth in Chapters 9 and 10.

I believe that the best manner for dealing with strong fundamentalists is through education, exposure to other ideas, and time. Our research has shown that the more you hear about, read about, and think different ideas, the more those ideas take root. Over time, distrust toward those who hold different beliefs begins to decline. This was recently demonstrated on a large scale in California’s “Bible Belt.” The Modesto public school system created a mandatory course on world religions for freshman high-school students. The program was accepted by an advisory council of Modesto’s religious leaders, and when the

#### **Will Skepticism Hurt Your Brain?**

No, but cynicism will. Skepticism implies open-mindedness and the willingness to suspend judgment until both sides of an argument are considered, and this enhances neural functioning, particularly in the frontal lobes. A cynic, however, is a person who has taken their disbelief to a point of emotional distrust and rejection that borders on hostility toward the other point of view. This “limbic” personality is pessimistic and is so neurologically dangerous it can even shorten your life.

students were tested after taking the course, their general respect for religious liberty increased. The students were less willing to express disrespectful opinions toward other religious members, especially Muslims. In addition, they felt greater comfort with their own religious identity, and they came away with increased understanding and appreciation of the similarities between major religions.

### **“Noble” Ideologies**

The problem, as we see it, is not religious fundamentalism but authoritarianism and the impulse to impose one’s ideals on as many people as possible. In fact, as Philip Zimbardo demonstrated in a famous experiment at Stanford University, it is socially and neurologically dangerous to place one’s self in a position of opened-ended authority.<sup>183</sup> He randomly divided a healthy group of adults into “prisoners” and authoritarian “guards,” then put them into a make-believe prison. All the guards were told to do was to maintain discipline and control over the prisoners. In less than twenty-four hours, the experiment spun out of control. Prisoners were punished, humiliated and degraded, and it soon mirrored the same type of behavior that U.S. soldiers doled out at Abu Ghraib, the American military detention prison in Iraq. Zimbardo pointed out that behind every form of religious and political abuse, you’ll find “noble ideologies that allow the worst possible destructions, because you could always say, ‘I did it for God.’”<sup>184</sup>

Sarah Mancuso, at Oberlin College, also discovered that it is the ideology itself that propels an individual toward violence.<sup>185</sup> Ideological rigidity—be it religious or political—leads to less openness toward change. Furthermore, religious and political idealists tend to be dogmatic, closed-minded, and intolerant of ambiguity.<sup>186</sup> They have a pessimistic view of others, and they perceive anyone who holds a different ideology as a threat to their own existence. Furthermore, the more extreme the ideologies become, the greater the degree of intolerance, especially toward those who hold different beliefs.

Mainstream conservatism—be it religious or political—does not reflect the kind of cognitive rigidity that I am describing here.<sup>187</sup> In fact, the number of American religious groups that are outwardly hateful is relatively small when compared to the general population. Thus, when it comes to fundamentalism, religion is not the problem. Not even the authoritarian ideologies that lie behind them are the source for the problems we see in the world today. Anger is the problem. And when anger is married to a specific ideology and organized into an institution—be it religious or political—then there is a real danger that individual hostilities will feed upon each other until an emotional tipping point is reached. At that moment, destructive irrational behaviors can more easily be expressed in the world. This is the underlying neurological basis for violence, and it all begins with the primitive fundamentalist traits that exist within the limbic brain.

### **When God Gets Angry With You**

Some people struggle so deeply with their inner wolves that they reach a point where they feel that God may be punishing them for the way they have led their lives. As a physician, I have often seen this in people who are dealing with certain types of disease, especially cancer and substance abuse. They first ask the question, “Why me?” They wonder if God is angry at them, and they often ruminate on guilt, asking, “Why did I get this problem when I have always tried to be good.” In the cases where young children are involved, I sometimes hear the parents lament, “Why would God allow this to happen to such an innocent being?” This is tantamount to

the question about why bad things happen to good people, a theme that has occupied the minds of philosophers and theologians for several thousand years.

When things don't go the way we think they should, the brain will wonder what went wrong. If you blame the world, or God, you've relinquished self-responsibility, and that certainly won't solve the problem. But if you blame yourself, guilt can shut your frontal lobes down. If that happens, you lose your ability to analyze the situation, and the longer you stay focused on negative self-beliefs, the more likely you are to become depressed.<sup>188</sup>

In hospital situations, most patients don't understand the medical reasons for their illness, and many blame themselves in a variety of creative ways: "I didn't eat right, or exercise, or properly pray." And if you're religious, you may wonder if you have sinned. If not, you might blame your subconscious mind. Sometimes these individuals don't even try to get better – they don't want to. They won't take their medications, they won't try abstinence programs, and they don't try to rework their lives. It's a very difficult cycle to break, especially for those who hold deep religious beliefs. Research has shown that religious fear and guilt can evoke feelings of depression and thoughts of suicide, particularly for people who believe that they have committed an unforgivable sin.<sup>189</sup>

Often, logic and medical reasoning has little effect on these patients. However, most university hospitals have come to realize that for many patients, the problem is as much a spiritual issue as a medical one. Thus, our medical facility, like many others, have added spiritual counseling and pastoral care to those who wish to use it. As doctors, we have come to realize that people need to deal with their spiritual pathology in addition to their physical and mental concerns. In this context, I am reminded of the biblical story of Job, who suffers terribly, even though he lives a virtuous life. His friends believe that he is a sinner and is being punished by God. Job questions God, but God declines to answer, until he finally says, "Where were you when I created the world?" The implication, at least for me, is that we can never know the mystery that is God. Nor should we be so arrogant as to think that we truly understand how the world works. This is where faith comes in, be it in our selves, or in God. Faith tempers our anxiety and fears, and it may even temper one's belief in an angry God. The beauty of Job's story is that it reminds the suffering believer that God is ultimately compassionate. And from the perspective of medicine and neuroscience, compassion can heal the body as well as the soul.

In the evidence we've cited throughout this book, it is obvious that most forms of spiritual contemplation lead to a healthier brain, and most likely to a healthier society as well. But you must exercise that brain by exposing yourself to new ideas. Think about God and spirituality in different ways, as deeply as you can, and you will learn to appreciate the diversity, fallibility, and mystery of human beliefs.

But no matter how open-minded you become, and no matter how tolerant or compassionate you think you are, there will always remain the remnants of a neurological exclusiveness and fundamentalism in your brain—a wolf that will respond with fear and anger to all that is different and new. The struggle between good and bad, between tolerance and intolerance, between love and hate, is the personal responsibility of every individual on this planet. The question remains: Which wolf will you feed, and which wolf will you tame?

## Chapter 8

### **Exercising Your Brain: Eight Ways to Enhance Your Physical, Mental, and Spiritual Health**

Throughout this book, we have emphasized that many forms of spiritual practice affect your brain in fundamentally healthy ways. It doesn't matter how you believe in God, and there is considerable evidence that such practices work even if you don't believe. Part of the reason for this is that spirituality is often defined in terms of personal values and the search for meaning and truth and thus, spiritual practices can take on many forms.

If you take the most conservative assessment of the hundreds of medical, neurological, psychological, and sociological studies on religion, two conclusions are evident. First, involvement with religious and spiritual activities generally does no harm, unless, as we described in the last chapter, you focus on an authoritarian God who fills you with fear and anxiety. And as we reported earlier in the book, even minimal religious participation is correlated with enhancing longevity and personal health.

The second conclusion is this: activities involving meditation and intensive prayer permanently strengthen neural functioning in specific parts of the brain that are involved with lowering anxiety and depression, enhancing social awareness and empathy, and improving cognitive and intellectual functioning. The neural circuits activated by meditation buffer you from the deleterious effects of aging and stress and give you better control over your emotions. At the very least, such practices help you to remain calm, serene, peaceful, and alert. And for nearly everyone, it gives you a positive and optimistic outlook on life.

However, when we looked closely at the neurological principles underlying most spiritual practices, we discovered that the health benefits associated with prayer and meditation can be achieved through activities that are unrelated to religion. Meditation is certainly one of the best ways enhance the neural functioning of your brain, but there are seven other “techniques” that you should consider incorporating into your life.

You won't find drugs on this list because, as a medical researcher, I am not convinced that they are any better at enhancing neural functioning than the methods I'm about to describe. Furthermore, most drugs can have potentially significant side effects.<sup>†</sup> Diet and supplements are also not included, not because they don't affect brain function—they do, in very important ways—but because it is nearly impossible to isolate how the component nutrients influence neural metabolism and health. It would require a separate book, and it would be far more controversial than the suggestions we are about make. Suffice it to say that a generally healthful diet is always good for your brain.

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<sup>†</sup> One interesting exception are the serotonin enhancing antidepressants. They appear to improve neural and synaptic plasticity, especially in areas related to memory storage and recall, and may even cause new growth in the hippocampus and amygdala.

‡Sleep also did not make it to our list, but not because it is unimportant to cognitive functioning. It is. In fact, sleep is so important to the brain that we cannot survive without it. Like other body parts, it needs time to rejuvenate and strengthen the connections between nerve cells. This process, called consolidation, enables nerve cells to strengthen their connections. If the brain does not rest, those circuits will be damaged. And if you *chronically* sleep less than five hours a night, cognition significantly declines.<sup>190</sup> The problem is this: a “good” night’s sleep is dependent upon many variables, especially the amount of stress you’ve experienced while being awake. In fact, even a single exposure to a stressful situation can disturb your normal pattern of sleep.<sup>191</sup> Any form of stress exhausts our neural capacity to function optimally, and nearly everything we do is stressful, to one degree or another. Take driving, for example. With every hour we spend on the road, our alertness decreases, and the resulting fatigue impairs cognitive functioning.<sup>192</sup> So the problem is stress-induced fatigue, and the cure is adequate rest.

Sleep deprivation will also disrupt normal neural functioning,<sup>193</sup> but it’s hard to assess to what degree, and in what ways, given all the variables involved in an individual’s constitution and life-style. For example, nearly every form of cognitive and physical disturbance will disrupt your sleep.<sup>194</sup> Sleeping pills won’t help either because many of them disrupt REM sleep and dreaming, which are essential components for maintaining a healthy brain. Deprive a rat, which normally lives two or three years, of REM sleep, and the poor thing will survive for about 5 weeks.<sup>195</sup> Sleep *disturbance* is the problem, but an increased *quantity* is not necessarily a cure.

Neuroscientific evidence has governed our choice in selecting the eight best ways to maintain a healthy brain, but it wouldn’t surprise me if we left out a few strategies that are equally effective in terms of promoting neurological health. Still, I think several items on our list will surprise you. None are based on any religious orientation, but you can easily integrate them into any spiritual tradition you favor. In fact, we believe that in addition to helping your brain, they can all be used to strengthen your ethical behavior and deepen your relationship with God. They will also transform your inner reality, and when that happens, your perception of the world will change. Your spirituality will change, and so will your notions of God.

### **The Eighth Best Way to Exercise Your Brain**

*Smile.* Even if you don’t feel like it, the mere act of smiling repetitively helps to interrupt mood disorders and strengthen the brain’s neural ability to maintain a positive outlook on life.<sup>196</sup> Even if you fake a smile, other people will respond to you with greater generosity and kindness. To my knowledge, the only religion to incorporate smiling into a spiritual practice is Buddhism. For example, Thich Nhat Hanh suggests that that we do “smiling meditation” whenever we have a spare moment during the day. Smile when you’re going up in the elevator, or when standing in line at the supermarket, and you will notice that the people around you calm down. You’ll feel better, you’ll exude empathy, and people will respond with kindness. As Thich Nhat Hanh wrote, “If we are not able to smile, then the world will not have peace.”<sup>197</sup> Smiles, by the way, are neurologically contagious in every culture, and women are more susceptible than men are.<sup>198</sup>

Smiling stimulates brain circuits that enhance social interaction,<sup>199</sup> empathy,<sup>200</sup> and mood,<sup>201</sup> and it even appears to be contagious.<sup>202</sup> In fact, smiling has such a powerful effect on the brain that if you just see a picture of a smiling face, you will involuntarily feel happier and more secure.<sup>203</sup> Conversely, frowning (or looking at frowning faces), stimulates feelings of

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‡ Sleep, too, is essential for maintaining a healthy brain. There is, however, a faster way to become relaxed and alert, which involves the stimulation of your precuneus, but you’ll have to wait until Chapter 8 to find out about this “secret weapon” of awareness.

anger, disgust, and dislike. In one controversial study, Botox injections into frown lines appeared to alleviate subjective feelings of depression.<sup>204</sup>

Laughing, however, stimulates different neural paths,<sup>205</sup> Laughing and humor did not make it onto our list because part of the mechanisms involved are associated with surprise and the perception of incongruity.<sup>206</sup> Laughter and humor stimulate the amygdala, suggesting that these feelings are more closely related to discomfort and fear.<sup>207</sup> This helps to explain why many people laugh when watching videos where others do foolish things and are hurt, for it may be a way of quickly releasing anxiety (an alternative explanation would be that some people experience an inherent sadistic pleasure when others make mistakes.)

There is some evidence to suggest that laughter may help to lower stress and boost the immune system, and it may even turn on various genes that are related to fighting cancer, diabetes, and AIDS.<sup>208</sup> But the changes appear to be temporary, and the studies fail to demonstrate if any appreciable improvements in health are gained.

Nurturing a laughing personality may be beneficial, but until someone takes a group of test subjects and asks them to arbitrarily laugh for 15 minutes per day, then scans them again in eight weeks, we really won't know if the neural circuits stimulated are related to anxiety, pleasure, sadism, or to peace.

However, we do recommend that you listen to "happy" music (yes, your brain organizes sound into a range of emotions). It can stimulate a smile response and improve your mood,<sup>209</sup> and it is particularly effective in helping your brain when you are dealing with a chronic or serious disease.<sup>210</sup>

### **The Seventh Best Way to Exercise Your Brain**

*Stay intellectually active.* This should be (if you will pardon the pun) a no-brainer. When it comes to the dendrites and axons that connect one neuron to thousands of others, if you don't use it, you will lose it.<sup>211</sup> Intellectual and cognitive stimulation strengthens the neural connections throughout your frontal lobe,<sup>212</sup> and this, in turn, improves your ability to communicate, solve problems, and make rational decisions concerning your behavior. Nearly every age-related cognitive disability is related to the functioning of your frontal lobe, so it's particularly important to exercise this specific part of your cortex, which, by the way, has more neural interconnections than any other lobe. A highly functioning frontal lobe also makes it easier to diet, exercise, and avoid tempting activities that have health risks.<sup>213</sup>

Memory and mnemonic exercises, strategy-based games like chess or mahjong, and other forms of visual/spatial exercises or games can significantly improve cognitive functioning, especially in older adults.<sup>214</sup> Furthermore, intellectual stimulation, in nearly any form, lowers your propensity to react with anger or fear. Imagination even improves the motor coordination of your body, and if you rehearse a dance step or a golf swing in your mind, you'll actually perform the task better. The same is true for attaining personal goals. The more often you imagine what you want, the more likely you are to achieve it.

Try to spend as many hours a day engaged in the most intellectually challenging activities you can dream up, and solve as many complex problems as quickly as you can, because speedy intellectual reasoning helps you to maintain a healthy brain.<sup>215</sup> Read books (fiction or nonfiction, it doesn't matter) or listen to books on tape. Watch the education and science channels on TV, take a class, attend a lecture, go to a museum, play chess, or write in your diary. However, doing math exercises and crossword puzzles apparently doesn't help,<sup>216</sup> and performance pressure can even interfere with memory functioning.<sup>217</sup> So be sure to make your

intellectual pursuits enjoyable. The research also suggests that you must engage in a wide variety of sophisticated, challenging cognitive activities in order to keep your neurons and dendrites well connected.

Engaging in religious and spiritual issues and problems will also stimulate brain function. Reading scriptures, reflecting on meaning, discussing issues with friends and seriously thinking about the deepest issues facing humanity are outstanding ways of activating complex circuits in your brain.<sup>218</sup> In fact, religious and spiritual issues are among the most challenging we face today. Focusing your mind on such problems, grappling with them, exploring different perspectives—all of these help to expand and enhance your brain's activity.

There is one mental activity that I suggest you be wary of: video game playing. The more you do it, the more aggressive you may become, and the more your coping skills are reduced.<sup>219</sup> Frontal lobe functioning declines, exasperating attention deficit problems,<sup>220</sup> dependency issues,<sup>221</sup> and addictive behavior in children and adolescents.<sup>222</sup> And, as we mentioned in the previous chapter, violent video games clearly stimulate aggressive behavior.<sup>223</sup> However, there is no convincing evidence to suggest that non-violent video gaming causes permanent neurological or behavioral damage,<sup>224</sup> so don't beat yourself up when you fail to pull your teenaged kids away from the computer. Besides, the frustration you feel will do more damage to your brain than to theirs.

But what about computer-based training programs? Can they improve brain function, cognition, or learning. Recently, there's been a great deal of publicity about different programs, but there's also been considerable controversy and doubt in the scientific and academic communities. Cognitive-based computer games appear to improve neural functioning, particularly for people with cognitive problems, but no one has yet created an effective way to compare one type of exercise to another.<sup>225</sup> One learning program, developed a few years ago to aid children in language and reading development, showed initial promise, especially when dealing with serious learning problems, but the improvements have been so small as to have little practical benefit.<sup>226</sup> Newer "brain fitness" programs that claim to reduce neurological deterioration have also been heavily publicized, and although the research looks promising,<sup>227</sup> we won't know for many years how practical they might actually be, especially for the average aging individual.

### **The Sixth Best Way to Exercise Your Brain**

*Consciously relax.* I'm not talking about taking a nap, or assuming the position of a couch-potato in front of a television set. I'm talking about deliberately scanning each part of your body to reduce muscle tension and physical fatigue. And if you add pleasant music, your body will relax more quickly.<sup>228</sup> Calming music, by the way, has been shown to sharpen your cognitive skills<sup>229</sup> and improve your sense of spiritual well-being.<sup>230</sup>

Simple, repetitive activities that are pleasurable and meaningful can also take you into a deep state of relaxation. In one of my most recent studies, we found that the ritual practice of counting rosaries lowers tension, stress, and anxiety. Many other religious and spiritual practices calm the mind and allow the brain to rejuvenate, and even activities like knitting will have a similar relaxing effect.

In the next chapter, I'll teach you several techniques that will help you experience a very deep state of relaxation, which turns out to be the first essential step in any meditation practice. But relaxation does much more than relieve bodily tension. It interrupts the brain's release of stress-stimulating neurochemicals, and stress is the number one killer in America. Lowering



stress reduces heart disease, high blood pressure, and pain. And the one of the keys to reducing stress involves the conscious focusing on the breath. However, when it comes to relaxation, a dozen deep breaths is not as effective as you might think. There's a much faster way to simultaneously relax *and* raise consciousness, and it comes in as #5 on our list.

### **The Fifth Best Way to Exercise Your Brain**

*Yawn.* Go ahead: laugh if you want (though you'll benefit your brain more if you smile instead!), but in my professional opinion, yawning is one of the best-kept secrets in neuroscience. Even my colleagues who are researching meditation, relaxation, and stress-reduction at other universities have overlooked this powerful neural-enhancing tool.

Several recent brain-scan studies have shown that yawning evokes a unique neural activity in the areas of the brain that are directly involved in generating social awareness and creating feelings of empathy.<sup>231</sup> One of those areas is the precuneus, a tiny little structure that is hidden below the folds of the parietal lobe. According to researchers at the Institute of Neurology in London, the precuneus appears to play a central role in consciousness, self-reflection, and memory retrieval.<sup>232</sup> The precuneus is also stimulated by yogic breathing, which helps to explain why different forms of meditation contribute to an increased sense of self-awareness.<sup>233</sup> It is also one of the areas that is hardest hit by age-related diseases and attention deficit problems,<sup>234</sup> so it is possible that deliberate yawning may actually strengthen this important part of the brain.

For these reasons, we believe that yawning should be integrated into exercise and stress-reduction programs, cognitive and memory enhancement trainings, psychotherapy, and contemplative spiritual practice.

Yawning is so effective and important to the functioning of your brain, that I'm going to ask you to review for yourself the twenty-plus yawn-related studies I've cited in the endnotes (you can read the abstracts by going to [pubmed.gov](http://pubmed.gov)). Why am I so insistent? Because if I were to ask you to put this book down right now, and yawn ten times to experience this fabulous technique, you probably won't do it. Even at seminars, after presenting the overwhelmingly positive evidence, when I ask people to yawn, half of the audience will hesitate. I really have to coax them so that they can feel the immediate relaxing effects. There's an unexplained stigma in our society implying that it's rude to yawn, and most of us were taught this when we were young.

As a young medical student, I was once "caught" yawning and actually scolded by my professor. He said that it was inappropriate to appear tired in front of patients, even though I was actually standing alone in a hallway at the time. Indeed, yawning does increase when you are tired, and it may be the brain's way of gently telling you that a little rejuvenating sleep is needed.<sup>235</sup> On the other hand, exposure to light will also make you yawn, suggesting that it is part of the process of waking up.<sup>236</sup>

But yawning doesn't just relax you—it quickly brings you into a heightened state of cognitive awareness.<sup>237</sup> Students yawn in class, not because the teacher is boring (although that will make you yawn as well, as you try to stay focused on the monotonous speech), but because it rids the brain of sleepiness, thus helping you to stay focused on important concepts and ideas. It regulates consciousness and our sense of self, and it helps us to become more introspective and self-aware.<sup>238</sup> Of course, if you happen to find yourself trapped in a room with a dull, boring, monotonous teacher, yawning will simultaneously keep you awake while sending a not-so-subtle message to the speaker.

Yawning will relax you and bring you into a state of alertness faster than any other meditation technique I know of, and because it is neurologically contagious,<sup>239</sup> it is particularly easy to teach in a group setting. One of my former students used yawning to bring her argumentative board of directors back to order in less than sixty seconds. Why? Because it helps people to synchronize their behavior with others.<sup>240</sup>

Yawning, as a mechanism for alertness, begins within the first twenty weeks after conception.<sup>241</sup> It helps regulate the circadian rhythms of newborns,<sup>242</sup> and this adds to the evidence that yawning is involved in the regulation of wakefulness and sleep.<sup>243</sup> Since circadian rhythms become asynchronous when a person's normal sleep cycle is disturbed, yawning should help the late-night party-goer reset the brain's internal clock—a gentle reminder that it's daytime, when alertness is most needed. Yawning may also ward off the effects of jet lag and ease the discomfort caused by high altitudes.

So what is the underlying mechanism that makes yawning such an essential tool? Besides activating the precuneus, which I described a few paragraphs ago, it regulates the temperature and metabolism of your brain.<sup>244</sup> It takes a lot of neural energy to stay consciously alert, and as you work your way up the evolutionary ladder, brains become less energy efficient. Yawning probably evolved as a way to cool down the overly-active mammalian brain, especially in the areas of the frontal lobe. Some have even argued that it is a primitive form of empathy.<sup>245</sup> Most vertebrates yawn, but it is only contagious among humans, great apes, macaque monkeys,<sup>246</sup> and chimpanzees.<sup>247</sup> In fact, it's so contagious for humans that even reading about it will cause a person to yawn.<sup>248</sup>

Dogs yawn before attacking, Olympic athletes yawn before performing, and fish yawn before they change activities.<sup>249</sup> Evidence even exists that yawning helps individuals on military assignment to perform their tasks with greater accuracy and ease.<sup>250</sup> So if you want to maintain an optimally healthy brain, it is essential that you yawn.

Numerous neurochemicals are involved in the yawning experience, including dopamine, which activates oxytocin production in your hypothalamus and hippocampus,<sup>251</sup> areas essential for memory recall, voluntary control, and temperature regulation. These neurotransmitters regulate pleasure, sensuality, and relationship bonding between individuals, so if you want to enhance your intimacy and stay together, then yawn together. Other neurochemicals and molecules involved with yawning include acetylcholine, nitric oxide, glutamate, GABA, serotonin, ACTH, MSH, sexual hormones, and opium derivate peptides.<sup>252</sup> In fact, it's hard to find another activity that positively influences so many functions of the brain.

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| <p style="text-align: center;"><b>12 Essential Reasons to Yawn</b></p> <ol style="list-style-type: none"><li>1. stimulates alertness and concentration</li><li>2. optimizes brain activity and metabolism</li><li>3. improves cognitive function</li><li>4. increases memory recall</li><li>5. enhances consciousness and introspection</li><li>6. lowers stress</li><li>7. relaxes every part of your body</li><li>8. improves voluntary muscle control</li><li>9. enhances athletic skills</li><li>10. fine-tunes your sense of time</li><li>11. increases empathy and social awareness</li><li>12. enhances pleasure and sensuality</li></ol> |
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Our advice is simple. Yawn as many times a day as possible: when you wake up, when you're confronting a difficult problem at work, when you prepare to go to sleep, and whenever you feel anger, anxiety, or stress. Yawn before giving an important talk, yawn before you take a test, and yawn while you meditate or pray because it will intensify your spiritual experience.

Conscious yawning takes a little practice and discipline to get over the unconscious social inhibitions, but people often come up with three other excuses not to yawn: "I don't feel like it," "I'm not tired," and my favorite, "I can't." Of course you can. All you have to do to trigger a deep yawn is to fake it six or seven times. Try it right now, and you should discover by the fifth false yawn, a real one will begin to emerge. But don't stop there, because by the tenth or twelfth yawn, you'll really feel the power of this seductive little trick. Your eyes may start watering and your nose may begin to run, but you'll also feel utterly present, incredibly relaxed, and highly alert. Not bad for something that takes less than a minute to do. And if you find that you can't stop yawning—I've seen some people yawn for thirty minutes—you'll know that you've been depriving yourself of an important neurological treat.

### **The Fourth Best Way to Exercise Your Brain**

*Meditate.* I wish I could say that meditation and intensive prayer were #1, because that's where much of my research has been focused, but being #4 is nothing to sneeze at (no, sneezing doesn't help the brain and may even be a symptom of a rare cerebellar disorder<sup>253</sup>). And when it comes to enhancing spiritual experiences, it certainly takes first place. If you stay in a contemplative state for thirty minutes to an hour, your experiences will tend to feel more real, affecting your nervous system in ways that enhance physical and emotional health. Anti-stress hormones and neurochemicals are released throughout the body, as well as pleasure-enhancing and depression-decreasing neurotransmitters like dopamine and serotonin. Even ten to fifteen minutes of meditation appears to have significantly positive effects on cognition, relaxation, and psychological health, and it has been shown to reduce smoking and binge-drinking behavior.<sup>254</sup>

There's even solid evidence that meditating before taking a test will significantly improve your score. When researchers at the University of Kentucky taught students a forty-minute relaxation and concentration technique, they did better than those who exercised or took a nap.<sup>255</sup> Caffeine helped, but not as much. The neurological evidence suggests that you'll get even better grades if you have a cup of coffee while you meditate and relax. And of course, don't forget to yawn.

Visualization, guided imagery, and self-hypnosis are specific variations of meditation, and are equally effective in maintaining a healthy brain. In the next chapter, we'll guide you through the basic steps for establishing a meditation practice that you can integrate into your personal or spiritual life.

### **The Third Best Way to Exercise Your Brain**

*Aerobic exercise.* Vigorous exercise strengthens every part of the brain, as well as what it is connected to – the body. If you're between the ages of 18 and 90, exercise is going to lengthen your life.<sup>256</sup> And, in general, the more the better. For example, running is better than walking, and walking is better stretching,<sup>257</sup> but it is important to find the "right" amount of exercise that feels the best for you. Certain health conditions will also affect the type and length of exercise that you can do, so creating a personalized program is a complex issue to address.

Exercise can even be viewed as a form of meditation because it involves sustained concentration and a deliberate regulation of body movements and breathing. Studies have even shown that it enhances relaxation<sup>258</sup> and spiritual well-being.<sup>259</sup>

Vigorous stretching, such as yoga, also does wonders for both your body and your brain. Yoga has similar cognitive benefits as other forms of contemplative meditation, and in a recent meta-analysis of 813 meditation studies, the researchers stated that yoga was as beneficial as exercise.<sup>260</sup> It can lower the risk of cardiovascular disease,<sup>261</sup> help control the symptoms of diabetes,<sup>262</sup> lessen the severity of menopausal symptoms,<sup>263</sup> reduce chronic back pain,<sup>264</sup> and prevent the onslaught of migraine headaches.<sup>265</sup>

In a study conducted in 2007, researchers at the Boston University School of Medicine found that levels of the neurotransmitter GABA increase after a single 60-minute yoga session.<sup>266</sup> Since people who suffer from depression and anxiety disorders have low levels GABA, yoga exercise is a valid modality for improving psychological mood. It even has been found to reduce the symptoms of schizophrenia.<sup>267</sup> Research has also shown that a few weeks of yoga training enhances a wide range of cognitive skills in children and adults.<sup>268</sup>

All forms of exercise enhance neural plasticity<sup>269</sup> and rebuild damaged circuits caused by brain lesions and strokes.<sup>270</sup> Exercise improves cognition and academic performance.<sup>271</sup> It repairs and protects you from the neurological damage caused by stress.<sup>272</sup> It enhances brain plasticity.<sup>273</sup> It boosts immune function.<sup>274</sup> It reduces anxiety.<sup>275</sup> It can be used to treat clinical depression<sup>276</sup> and it is just as effective as antidepressants.<sup>277</sup> In fact, for older patients, exercise is equivalent to twelve sessions of psychodynamic psychotherapy.<sup>278</sup> It slows down the loss of brain tissue as you age,<sup>279</sup> protects you from Alzheimer's disease,<sup>280</sup> and reduces your vulnerability to chronic illness.<sup>281</sup> Need I say anything more to convince you of the importance of exercise?

A forty-minute cardiovascular workout every other day is enough to keep your brain healthy, but why limit yourself to just one modality? When you look at all of the techniques that have been proven to be effective in treating physical and emotional problems, you'll find that most treatments use a combination of approaches. For example, when Dean Ornish created his famous program to reverse heart disease, he combined exercise with meditation, breath awareness, relaxation, and a low-fat vegetarian diet.<sup>282</sup>

Combined strategies are always more effective, so why not assemble all of the above techniques into a cardiovascular meditation? Warm up with a dozen yoga stretches and yawns, then put on your running shoes and smile. And, since there's no reason why you can't contemplate God or focus on developing inner peace as you strengthen your muscles, bones, heart, and brain, why not pick a spiritual or personal goal that you want to accomplish in your life? You can literally sprint to success. Get together with a small group of spiritually-minded friends and sponsor an interfaith marathon with your church. Become a cardiovascular Christian. Do isotonic for Islam. Jog for Judaism. Bike for Buddhism. Eat plenty of vegetables and be as healthy as a Hindu. And don't forget to yawn. You'll open your heart and your mind, in both a spiritual and literal way.

If you think this sounds silly, let me tell you about an experiment conducted with nineteen churches in Baltimore, Maryland.<sup>283</sup> Five hundred twenty six Baptist, Holiness, Catholic, and Methodist African-American women spent a year integrating spirituality and exercise. They did aerobics to gospel music, and chanted religious praises during a cardiovascular dance. They also received scripture-based messages encouraging physical activity and healthy eating. Participants had significant improvements in dietary energy and blood

pressure, weight and waist reduction, total fat reduction, and lower sodium intake. The self-help control group had no spiritual interventions and showed no improvements in health.

Just imagine if every church integrated spirituality with physical exercise and dietary advice. Wouldn't we all live longer, and in peace?

### **The Second Best Way to Exercise Your Brain**

*Dialogue with others.* Language and the human brain co-evolved with each other,<sup>284</sup> allowing us to excel over many of the physical and mental skills of other mammals and primates. And if we don't exercise our language skills, large portions of the brain will not effectively interconnect with other neural structures. Dialogue requires social interaction, and the more social ties we have, the less our cognitive abilities will decline.<sup>285</sup> In fact, any form of social isolation will damage important mechanisms in the brain.<sup>286</sup> Without dialogue, we would not be able to cooperate with others, and without cooperation, human behavior rapidly deteriorates into conflict. We can either talk our way out of a problem, or fight our way out, and dialogue is certainly the more civilized solution for attaining maintaining, global peace.

But don't just talk about the weather, or gossip about the neighbors. These forms of dialogue are really more like monologues, and they won't engage the brain as much as a deeper conversation will. Talk about abstract ideals like harmony and peace. Ask what your neighbor thinks about evolution and the Big Bang. Talk about what the 23<sup>rd</sup> Century might look like, and by all means talk about God—but with one caveat: don't get entrapped in an angry dialogue. As we made clear in the previous chapter, irritable conversations will do extensive damage to your brain.

Since religion is central to many of the world's conflicts, we need to create empathic communication strategies to bridge spiritual differences. Unfortunately, communication skills are rarely taught in schools or in religious groups. To address this issue, we have taken the principles of meditation and adapted them to create a unique dialogue experience that you can do with anyone: with your partner, your kids, your friends, your business associates, or even a complete stranger. It will create deep intimacy between any two people in less than ten minutes, and it only takes five minutes to learn. We'll teach you how to practice Compassionate Communication in Chapter 10, but first, it's time to share with you the most essential component for maintaining a healthy brain.

### **The #1, Absolute, Best Way to Exercise Your Brain**

*Faith.* No matter what choice we make concerning our physical, emotional, and spiritual health, we'll never know for certain if we are absolutely correct in our beliefs. And no amount of scientific research will establish an ultimate truth. Furthermore, we can never objectively know what reality actually is because we are trapped within the confines of our brain. Nor can we fully step outside ourselves to see how accurate our perceptions may be. We can make educated guesses about the world, but some degree of uncertainty will always remain. This is true for medicine and science, and it's certainly true when it comes to our religious beliefs.

Still, we have to trust our beliefs, and this is a matter of faith. But it's always unsettling to realize that we can't be one-hundred percent sure about anything. We can't even trust our eyes when it comes to something as obvious as color, because color doesn't exist in the world. Light waves exist, but we can't see them at all. We only know they exist through the instruments we construct and the mathematical formulas that underpin our experiments. Color is a product of our imagination, and so is our perception of the world.

The same can be said about God. Like color—which is a personally constructed inner interpretation of light waves—our brains are likely to create images and concepts that have little to do with the reality of God. And unlike color, we don't have good instruments to measure the nature of spiritual beliefs. We can take surveys, or scan people's brains as they contemplate God, but this will tell us more about the brain and nothing about the true nature of belief.

To be spiritually inclined, you have to rely on faith. Those who don't believe in such realms will use different criteria to govern their decisions and ideas, but they, too, must rely upon their intuition and faith to guide them through the unknown aspects of life. None of us can be certain if we've made the "right" decision, especially when it comes to dealing with abstract concepts like justice, fairness, or moral ideals. If we don't have faith that we are making the best decision we can, then we will be swallowed up in doubt. And doubt, at least as far as your brain is concerned, is a precarious state in which to live.

Faith is equivalent with hope, optimism, and the belief that a positive future awaits us. Faith can also be defined as the ability to trust our beliefs, even when we have no proof that such beliefs are accurate or true. The psychiatrist Viktor Frankl, who was imprisoned in a Nazi death camp until the end of World War II, said that the single most important thing that kept a survivor alive was faith. If a prisoner lost faith in the future, he was doomed, because the will to live seldom returned. For Frankl, faith was essential for dealing with all aspects of life: "A weak faith is weakened by predicament and catastrophes whereas a strong faith is strengthened by them."<sup>287</sup>

Similarly, I am convinced that for many people, if their faith in God was weakened, he or she could suffer deeply. Clearly, this happened to many Jews, who came away from the Holocaust with the nearly unbearable question, "God, how could you let such a tragedy occur?" Many abandoned their faith in God, but they maintained their faith in humanity, and in their cultural heritage as Jews. More important, many chose to fight for the religious and civil rights of others.

To me, it doesn't matter if God is an illusion or fact, because even as a metaphor, God represents all that we are capable of becoming, an ideal that offers hope to millions of people throughout the world, especially for those who may have little to fall back upon other than their religious ties. Faith in an optimistic future may be a placebo, but it's important to remember that placebos can cure, on the average, 30% of the majority of physical and emotional diseases. Even an irrational belief in a cure that has been proven not to work can significantly boost the body's immune system when dealing with a deadly disease.<sup>288</sup>

Recently, a team of National Institutes of Health researchers concluded that "a moderate optimistic illusion" appears to be neurologically essential for maintaining motivation and good mental health.<sup>289</sup> They also found that highly optimistic people had greater activation in the same parts of the anterior cingulate that are stimulated by meditation. If you recall from previous chapters, the anterior cingulate plays a crucial role in controlling anxiety, depression, and rage, as well as fostering social awareness and compassion.

Even the medical researchers at the Mayo Clinic stress the importance of optimistic thinking for maintaining optimal health. They found that positive thinking decreases stress, helps you resist catching the common cold, reduces your risk of coronary artery disease, eases breathing if you have certain respiratory diseases, and improves your coping skills during hardships.<sup>290</sup> An optimistic attitude specifically reduces the stress-eliciting cortisol levels in your body,<sup>291</sup> and many other studies have demonstrated how optimism improves behavioral coping in a variety of physical illnesses,<sup>292</sup> and in a forty year follow-up conducted at Duke University,

optimists had increased longevity when compared to pessimistic individuals.<sup>293</sup> Indeed, the role of optimism is so important in maintaining psychological health that the University of Pennsylvania has an entire institute—the Positive Psychology Center, headed by Martin Seligman—dedicated to this research.<sup>294</sup>

Faith is essential for maintaining a healthy brain, but if you exclude exercise and companionship, you are going to cripple your health. So my advice is to nurture all three. And if religion is high on your list, then I suggest that you include meditation, since it appears to be the best way to make spiritual values neurologically real. For those who don't value religion, meditating on hope, optimism, and a positive future will have similar neurological benefits.<sup>§</sup> Best of all, meditation undermines the everyday doubts and anxiety we all harbor when we choose reach for new goals and ideals. In other words, meditation will strengthen your faith.

### **The Principles of Affirmation**

Before I close this chapter, I want to briefly address the widespread popularity of the “power of positive thinking,” especially as it relates to the notion that you can use your thoughts to attain anything you want in the materialistic world. Overly simplistic books and CDs like *The Secret* have been turned into million-dollar bestsellers when they're touted by television talk-show hosts, but do they really work? From a neuroscientific perspective, the answer is yes.

In fact, nurturing a fantasy is the first step in the neural process of achieving success in the world. It begins with creative imagination, a process that takes place in your frontal lobe, the area in your brain that has the unrelenting capacity to dream up virtually anything. If you can't imagine a specific goal, you won't make it to second base, which is figuring out how to make your dream come true.

Now, as I have emphasized throughout this book, truth can only be approximated by the brain. Instead, what the brain does best is to calculate the odds of success. Here is where faith kicks in, because it is essential to remain optimistic about your chances of reaching your goals.

So what do you do when all of the subtle, and not-so-subtle, self-doubts kick in? You can do several things: suppress them, evaluate them, or ruminate on them. Neurologically, it's actually easier to suppress them, because the more you keep your mind focused on your optimistic belief of success, the more you will inhibit the functioning of your limbic system that generates doubt and fear. However, anxious individuals have a more difficult time suppressing negative thoughts,<sup>295</sup> and often get caught up in the repetitive process of rumination. This, unfortunately, strengthens the neural circuits that are generating anxiety and embedding the information into long term memory banks. We recommend that such people engage in a more intensive meditation regime, as we will describe in the next chapter.

But suppression of negative thoughts is not enough to make any dream come true. At some point, you may have to evaluate the practicality of your goal. For example, practitioners of Transcendental Meditation® used to believe that if they concentrated hard enough, they would eventually be able to levitate. Known as “yogic flying,” some students spent thousands of dollars for training, but so far, all anyone has been able to do is hop. It may be an ecstatic, enlightened hop, but it isn't levitation. Well, the same holds true for obtaining wealth. If you concentrate

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<sup>§</sup> Neither religion nor a belief in God made it to our “Top Eight” list because religious beliefs, in and of themselves, have no specific effect on the brain, especially if they hold little meaning or value. However, for some people, disbeliefs may have a negative effect on neural functioning, especially if you ruminate on them for extended periods of time.

hard enough, I do not doubt that your income will rise, but don't be surprised if doesn't reach the moon.

Concentration is essential to set your goal in motion, and the suppression of self-doubt is critical, but more is necessary to achieve success. You have become motivated to do something more than just dream. You have to take action, you have to tell others about your dream, and you have to have something to offer them to make them participate in your success.

In other words, you can't do it alone. And you can't depend on the universe to oblige your every whim, as some of these books suggest. There's no clear evidence that there is a quantum force that emanates from any part of you that influences the cosmos to do your bidding. Quantum properties do appear to be involved in the synaptic activity between neurons,<sup>296</sup> and we can use quantum dots to track peptides in cells,<sup>297</sup> but this does not clearly translate into any observable phenomena inside or beyond your body.<sup>298</sup> Even if quantum physics could be shown to influence your life, it would seem more likely to do so on the quantum level, meaning that you'd experience a *sub-atomic* increase in personal wealth. Dream about a million bucks, and you'll be a penny richer! Certainly we can all do better than that.

The magic comes when other people feel your optimism and excitement about your project, which makes similar circuits in their brain resonate to yours. If they have the time, energy, and mutual interest, they will be neurologically inclined to join forces with you, or at least support you and give you helpful advice.

The longer you focus (i.e., meditate) on your goal, the more real it begins to feel, and if you stay focused long enough, you'll permanently alter the neural circuitry in your brain. The same is true for any principle or belief. Focus on God long enough and God becomes neurologically real. Focus on peace, and your body will become relaxed and serene. And if you intensely focus on wealth, monetary issues will permeate your mind and influence your behavior in the world.

Goal achievement begins with the belief that you can succeed, but it is equally important to establish what goal you truly desire. This, too, is easy to do. Chris and Janet Attwood, authors of *The Passion Test*, describe a tried-and-true technique of making a list of your desires and goals that you will meditate on and review throughout your life.<sup>299</sup> They also suggest that you create a "vision board" that contains pictures and images associated with your goal. From a neuroscientific perspective, this makes a lot of sense because the visualization process makes it easier for the brain to translate ideas into attainable goals.

When you meditate on what you desire, immerse yourself in positive images associated with your goal. For example, try to envision meeting important people who can help you on your quest. Then take action. Call up everyone you know—not with trepidation, but with the knowledge that people are neurologically inclined to help—and ask them for the name of someone who they might know who might help you to achieve your goal. In very little time, you'll connect with the right individuals. Networking is the fastest way to success, especially when it concerns relationships and work.

### **Are There Any Drawbacks to Unrealistic Optimism?**

Skeptics might argue that maintaining an illusory optimism is problematic, but the evidence points in the opposite direction. Researchers at the University of California found that people who have self-enhancing illusions exhibit lower cardiovascular responses to stress, more rapid cardiovascular recovery, and lower baseline cortisol levels.<sup>300</sup> In fact, an unrealistically



optimistic belief about the future appears to be health protective, even when dealing with a disease as serious as AIDS.<sup>301</sup>

Simply put, faith and optimism will add months or years to your life,<sup>302</sup> and the only drawback is a decreased perception of risk.<sup>303</sup> It will even increase your resistance to common colds and flu viruses, but it also bias you toward under-estimating the severity of your symptoms.<sup>304</sup> Optimism causes people to underestimate their risk of getting divorced and to overestimate their prospects for success in the marketplace. And yet, if you do not project such positive illusions onto the future, you'll cripple your likelihood for success.

However, optimism can be taken to an extreme, especially if you choose to ignore realistic concerns. For example, optimistic smokers underestimate their chances of getting ill,<sup>305</sup> and this is indeed a dangerous form of faith. All forms of optimism are associated with a less realistic view of the world.<sup>306</sup> But then again, so is pessimism,<sup>307</sup> so the question we must face is this: Are we using our optimistic beliefs to maintain a destructive behavior or belief? If so, then a healthy dollop of reality-testing should be added to your recipe for health.

If the human brain did not have a bias toward optimism, we would be prone to increased anxiety and depression.<sup>308</sup> Pessimism, however, has few benefits, and it leaves the person more at risk to depression, anxiety, sleeping problems, obsessive-compulsive behavior, and impaired social functioning.<sup>309</sup> In a thirty year longitudinal study conducted by the Mayo Clinic, pessimism was significantly associated with a shorter life-span and poorer mental functioning.<sup>310</sup>

Evolution has given us the biological ability to be optimistic and hopeful about the future, even when there is no concrete evidence to support our beliefs. This, too, is one of the functions of our frontal lobes, but we need to exercise it daily, having faith in humanity, and especially in ourselves.

## **Chapter 9**

### **Taming the Demons of the Mind: Meditation, Intention, Relaxation, and Awareness**

God can change your brain. This much we have shown. But now our meditation research has brought us to a turning point, for we can distill from the world's spiritual practices a set of simple exercises that will enhance the neural functioning of the brain. When we do so, we improve our physical, emotional, and cognitive health, adding years of greater happiness to our lives.

As a doctor, I must emphasize that these techniques do not, in any way, replace the appropriate use of current medical practice, but if you add them to your daily repertoire of activities, you will find that they can have very powerful effect on your life. They will boost the responsiveness of your immune system, sharpen your productivity at work, and enrich the quality of your relationships, not just with family and friends, but with strangers who you might casually meet. Empathy and compassion will be enhanced, and you'll even find it easier to interact with those who hold beliefs that differ from your own. That's a lot to promise, but we feel that the thirty-plus years of research into the underlying mechanics of spiritual practice is so

conclusive that we are incorporating these exercises into various programs at the University of Pennsylvania's Center for Spirituality and the Mind.\*\*

## **Intention**

The exercises we will present in this chapter all center on three main interconnecting principles: intention, relaxation, and awareness. *Intention* refers to the goal that you want to manifest in your life, and everything we do has an underlying intention, whether we are conscious of it or not. We use our intention to determine what we really want to focus on, and the goal can be anything you want: money, power, peace, romance, or a closer connection to God. Before you sit down to practice any of the following exercises, clarify what your intention is. Better yet, write it out on a slip of paper and keep it posted in a prominent place. When you clearly articulate your intention or goal, your frontal lobes can more efficiently direct your motor cortex to carry out your desire as you actively engage with others in the world.

It's really an extraordinary process: you begin with a goal-oriented thought, and the more you focus on it, the more your brain begins to plot out strategies to carry that thought into the world. Other animals, even primates, can barely do this because they have far fewer neural connections that run from the frontal lobe to the other parts of the brain.

## **Relaxation**

*Relaxation* is the second principle, and it is found in most contemplative practices and stress-reduction programs. Thus, one begins the intention of consciously relaxing the body. Usually this involves focusing on the breath, but as we mentioned in the previous chapter, yawning is probably a faster way to achieve deep relaxation and alertness.

Breath awareness serves another function, because it trains your mind to stay focused on a natural—and essential—body process. By focusing your conscious intention on your breath, you begin to slow down mental “busy-ness.” Your thoughts become fewer, but more integrated, and your body begins to relax. In an fMRI<sup>††</sup> experiment we just completed, when we compared a breath-based meditation to a meditation that focuses on a word or phrase, we discovered that breathing awareness increases activity in the limbic system while activity in the frontal lobe decreases. Thoughts recede, but the emotional intensity of the experience increases.

Relaxation is a key element in meditation and keeping your brain tuned up, but for many people, focusing on one's breath will not achieve the deep state of relaxation that is associated with neurological health. That is why we've included several different kinds of relaxation exercises, and I strongly recommend that you try them all. Use the ones that feel best, but it's also a good idea to alternate between them. Over time, you'll realize that the same technique affects your body in different ways.

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\*\* The Center for Spirituality and the Mind brings together an interdisciplinary group of faculty from all of the schools of the University to develop, organize, and coordinate research, scholarship, education, and dialogue, both locally and globally, that focuses on the relationship between spirituality and the brain. By establishing courses, teaching materials, public and academic lecture programs, and local and internet outreach programs, the Center's resources will be available for all individuals interested in topics related to the intersection of religion and science.

†† An MRI brain scan shows a detailed picture of brain's structure, whereas an fMRI (*functional* magnetic resonance image) scan is more like a motion picture. We can watch moment-to-moment changes in the brain as the test subject performs different mental or physical tasks.

## **Awareness**

Once a deep state of relaxation is reached, the next step involves becoming aware of your body in relation to the world. Focused breathing enhances self-awareness by increasing activity in the precuneus, an important circuit that regulates consciousness in the brain.<sup>311</sup> But in Eastern practices, this is only the first step in generating greater awareness and attentiveness. For example, you might be asked to observe a simple activity like eating or walking. Usually, you will do it in slow motion, paying attention to every tiny movement you make. If you put some food in your mouth, you'll pay attention to every muscle that is used when chewing, noting the subtle qualities of smell, flavor, texture, and temperature of each bite. You'll pay attention to every muscle needed to lift the fork to your mouth.

You can experiment with this technique right now. Because your attention is focused on reading, you'll notice that you aren't aware of the book that you are actually holding in your hands. But the moment I bring your attention to it, other sensations become conscious. Notice how heavy the book feels in your hand. Now notice the texture of the book's cover. What does the smoothness feel like? Is it warm, or cool? And what about the paper on which these words are imprinted? What color is it? How dark or light is the ink? What happens if you focus on the spaces, rather than the words? Now do one more thing: take in ten very deep breaths and watch how your sensation of the book changes.

Each of these shifts in awareness intensifies the experience of the book, and this is what meditation is designed to do. It heightens both the quality and quantity of the experience, and it reminds you that there is so much "experience" in everything we do. Meditation broadens your scope of conscious experience and this strengthens important circuits in your brain. And it neurologically helps your frontal lobes become more focused and organized. Research confirms that advanced meditators have a greater cognitive ability to recognize subtle changes, not only in themselves, but in the environment as well.<sup>312</sup>

There is another neurological benefit, for as you become aware of your mental processes, you learn to watch them, and not react. You simply observe your thoughts and feelings as they constantly flow through your mind. Some refer to this as "mindfulness". If an anxious, irritable, or depressing thought pops up, you note it, then immediately return to your breathing or relaxation, watching what the next thought or feeling will be. Frontal lobe consciousness increases to the point that it begins to neurologically suppress the emotional circuits in your brain. When this happens, feelings of anxiety, irritability, or depression subside, and this has a profoundly beneficial effect on every other aspect of neural functioning.

## **What Happened to God?**

Even though some of the following exercises grew out of different religious traditions, the neurological benefits are primarily associated with intention, relaxation, and awareness. So, for the purposes of reaching the broadest audience, we have removed the religious inferences. However, if you incorporate your ethical, spiritual or religious beliefs into these exercises, they can become even more meaningful and experientially rich. For example, we recently studied the religious practice known as the Rosary, which involves the repetition of specific prayers as you count a string of beads, and we found that performing it is associated with lower levels of anxiety and stress. Furthermore, you can easily bring many of the following techniques into your church, temple, or mosque and integrate them into the rituals of the religion. In fact, Eastern meditation has been widely adapted by many sects of Christianity.

This brings us to the question of religious involvement in general. Does it have a meaningful effect on your health? The answer, briefly put, is “yes.” The data on religious involvement consistently shows that those who regularly attend religious services live longer and have less problems with their health. Even those who attend once a month have a 30-35% reduced risk of death.<sup>313</sup> The numbers are equally consistent for Caucasians, African Americans, and Mexican Americans, and for older individuals, religious activity is even more beneficial.<sup>314</sup> Those who attend weekly are significantly less likely to have a stroke, but interestingly, religious involvement did not have an effect on heart attacks.<sup>315</sup> Nor does it protect a person from abusing drugs.<sup>316</sup> Overall, it appears that religious activities and beliefs have only a minor effect on an individual’s use of drugs.

Are there any drawbacks to religious involvement? Yes, but it mostly involves issues concerning anger and fear. As we mentioned in Chapter 7, if you see God as a punishing figure, or have negative attitudes toward the clergy or other church members, you will be inclined toward poorer health and depression.<sup>317</sup> And if you find yourself in conflict with your religious feelings or beliefs, your health can deteriorate and your risk of dying will increase.<sup>318</sup> So by all means, pick a religious system or spiritual practice that makes you feel good about yourself and others.

### **Confronting the Belligerent Brain**

The exercises we will describe can change your brain in a matter of minutes, but many people resist doing them, even when they feel the improvement in cognitive function and mood. Why? There are different explanations, but the one that makes the most neurological sense is this: after spending decades building a somewhat stable personality to handle life’s tribulations, the brain is hesitant to alter its underlying beliefs. After all, even if your behavior is dysfunctional, it has helped you to survive, and that is what your brain is primarily designed to do.

It took your brain decades to form these habits, and it’s not easy to turn them off. Old neural circuits do not disappear, especially if they are tinged with negative or stressful memories. In fact, it takes a lot of metabolic energy to grow new dendrites and axons and rearrange synaptic connections that have been firmly established over the years, and any disruption in these old neural patterns creates a certain degree of anxiety in the brain. That old limbic system, which is largely responsible for maintaining synaptic stability, is not as flexible as the creative frontal lobes. Thus, it’s easy to dream up a new idea, but exceedingly difficult to get the rest of the brain to comply. Even if you succeed in changing different aspects of your personality, don’t be surprised if old patterns of behavior reassert themselves from time to time.

So what is the solution to this neural resistance to change? Mark and I recommend three things: A conscious commitment do make a small improvement every day, a good dose of social support to help you honor that commitment, and a hefty serving of optimism and faith.

Oh, and one other thing: a willingness to practice, at the very least, for a few minutes every day. With practice, you can build up to a half an hour or more, and if you want to drop by our laboratory after a few months we’ll show you what has changed in your brain.

### **Begin with a Simple Goal**

When learning meditation on your own, it is wise to begin with simple tasks, then work your way up the ladder to more complex tasks. At that point, you can even work in some of the loftier ideals of loving-kindness and compassion. But if you ultimately want to promote world

peace, start by generating a few minutes of peacefulness during a coffee break. Then extend it into your lunch hour. Yawn a few times and take several deep breaths when you find yourself stuck in rush-hour traffic, and send a small blessing to the driver who just cut you off. At first you'll feel some resentment, but after a week, you'll notice an overall lessening of frustration.

Pick a simple goal for today—right now. It doesn't matter what you choose, because if you focus on the three main principles – relaxation, focused awareness, and intention—your brain will stimulate neurological circuits to help you accomplish that goal. The key to reaching any goal is conscious commitment, and the first step that is required is to stay focused on the idea. Focused awareness teaches you to ignore competing goals or desires, and relaxation will teach you patience, something that is essential to help you over those moments when you think that the meditation is doing nothing at all. Whether you are aware of it or not, neuroscience demonstrates that benefits are unconsciously taking place.

Beginners often find it frustrating to stay focused on something as simple as relaxation or the breath. Irritating thoughts intrude, so if you find that you can't turn them off, shift your goal to passively watching them. I mentioned it earlier, but it bears repeating: by training yourself to observe your thoughts, you are learning to subdue the emotional reactivity that normally governs the neural activity of the brain. Sitting quietly and watching your thoughts and feelings may seem like a boring activity, but for people who ruminate on anxious or depressing thoughts, it turns out to be a profoundly therapeutic process. In fact, rumination on negative thoughts and emotions intensifies and prolongs the experience,<sup>319</sup> and it stimulates the amygdala to generate increased anxiety and fear.<sup>320</sup>

Still, if you are like most beginning meditators, it can drive you nuts to just sit there and watch your mind telling you that you're a fool to be sitting there, doing nothing. After all, your frontal lobes are inclined to induce you to do something—*anything*, for that matter. It's a powerful incentive, driven by parental and societal norms and maintained by all the beliefs you have melded together over the years. In fact, your mind can generate so many distracting thoughts and reasons to dissuade you from doing these exercises, that a few good books may be needed to keep you on the mindfulness meditation path. Books by Jack Kornfield, Jon Kabat-Zinn, and Sharon Salzberg are excellent beginner guides, but a stroll through any bookstore or the virtual shelves of Amazon.com will tease you with useful alternatives. If you suffer from chronic unhappiness, get a copy of the book, *The Mindful Way through Depression*, which includes a CD that guides you through the stress-reduction training program developed at the University of Massachusetts Medical School.<sup>321</sup> Meditation and relaxation CDs are particularly helpful since the instructions are easier to follow when you listen to a spoken voice, and when we conduct our research with initiates, we often send them home with an audio-recorded exercise. In Appendix 2, you'll find a list of recommendations for a variety of books, CDs, and training programs.

### **Practice, Practice, Practice**

So how long should you practice? It's really up to you. Research studies often use a specific amount of time such as an eight-week training program with up to fifty minutes of practice each day, but if you only feel comfortable meditating for five or ten minutes, then trust your intuition. Obviously, the more time spent, the greater the results. I would recommend that if you want to create a formal program, you try to set aside a specific time of day like the first thing in the morning after you awake, shortly after work, or the last thing in the evening right before bed. A regular time trains your brain to get into the habit of being mindfully relaxed, and the less

you do it, the less it will work for you. In our studies, we have found that those who set a specific time received the greatest degree of benefit.

Here's a list of the exercises that we have included in this chapter:

- #1: Breathing Awareness
- #2: Deep Yawning
- #3: The Relaxation Response
- #4: Progressive Muscle Relaxation
- #5: Visualization and Guided Imagery
- #6: Candle Meditation
- #7: The Centering Prayer
- #8: Walking Meditation
- #9: Memory Enhancement
- #10: Sitting with Your Demons
- #11: The Imaginary Fight
- #12: Sending Kindness and Forgiveness to Others

In developing your personalized “brain enhancement” program, we recommend that you do three of these exercises each day. Nearly every meditation and stress-reduction technique begins with a breath awareness exercise, and so we suggest that you begin with Exercise #1. Exercises 2 through 5 will take you into deep states of relaxation, so you should select at least one of these to practice every day. On different days, you can switch between them, and as you become more skilled, you can vary them or combine them at will. Finally, pick one of the more formal meditations (6 through 9) to practice each day.

When you combine these three breathing, relaxation, and meditation exercises, you will have created a basic brain enhancement program that will provide you with a 20 to 40 minute daily practice. But if you don't have the time to practice this long, select the one of the exercises that most closely aligns with your intention, desire, or goal. Perhaps at another time (for example, before going to bed), you'll be able to add another exercise or two.

Exercises 10 and 11 are specifically designed to use when you are dealing with anger, irritability, and frustration, and Exercise 12 focuses on forgiveness and self love. However, you'll get the most from these meditations if you first begin with a breathing awareness and relaxation exercise.

### **Test Driving Your Brain Enhancement Program**

As you go through the twelve exercises in this chapter, practice each one, as best you can, while you read. Then select the ones you plan to practice tomorrow. Write them on a sheet of paper, and set an alarm clock to remind you when to begin. As I mentioned earlier, your brain will neurologically provide you will an endless stream of resistances, which is one of the first things that all beginning meditators discover. And don't feel bad if the resistance doesn't fade away. Even the Dalai Lama says he has trouble meditating, which is why he does it all the time.

Before we begin, I want to include a brief note about sitting positions, postures, and the use of mantras, prayers, or sounds. Different teachers will sometimes argue that one specific posture or prayer is more effective than others, but the neurological evidence disagrees. You can stand, sit on a Zen cushion, recline in your favorite chair, or lie down. None will alter your

cognitive function in any significant way, but what is important is that you feel comfortable and relaxed. The only drawback with lying down is that you might fall asleep.

Nor has any specific mantra or sacred word been proven to be better than another for obtaining healthy neurological results. Instead, we recommend that you choose a phrase that has meaning for you, because this will significantly enhance your practice. The brain actually “marks” these important rituals, and thus each time you perform them, your memory circuits will guide you into the desired state more quickly, and with greater intensity each time.

### **Exercise # 1: Breathing Awareness**

Some meditations use passive techniques, in which the practitioner is instructed to simply pay attention to his or her natural breathing patterns, while others use various forms of controlled breathing: light, deep, slow, rapid, nasal, mouth, or a combination of styles. Gentler forms of breathing enhance awareness and relaxation, while vigorous styles increase emotional intensity at the expense of feeling relaxed. Research has shown that breathing exercises lowers stress and anxiety, improves coping skills, helps people deal with substance abuse, improves one’s general sense well being, and improves self-esteem. Breathing exercises also help people deal with problems such as panic disorder, heart disease, and lung disease.

Slow focused breathing triggers the body’s relaxation response.<sup>322</sup> It also increases dopamine levels in different parts of the brain during the first ten minutes of meditation, which explains why the experience is pleasurable.<sup>323</sup>

Deeper breathing triggers a different neurological response and initially decreases activity in the frontal lobes. It lowers the amount of carbon dioxide in the blood, which in turn lowers blood flow in other parts of the brain and reduces cognitive activity. Simply put, it helps you to get out of your head, so if you have trouble turning down your thoughts, deepen your breathing as you meditate.

Deep or rapid breathing also has a stimulating effect on the limbic system, and this can trigger a wide variety of emotional responses. If you do it for even a few minutes, it can disrupt your consciousness in unexpected and sudden ways. For this reason, we suggest you limit deep or rapid breathing to no more than thirty seconds at a time, then return to gentler breathing for the next few minutes, or longer. So let’s get going with most basic meditation practice in the world – breathing. We’ll begin with you sitting in a chair, but later, you may want to try other postures, like lying down, or sitting upright on the floor. If you have someone reading this to you, close your eyes; it will help you to concentrate better.

#### **What’s so Spiritual about Breathing?**

In Western cultures, breathing would not be considered a spiritual activity, but in Eastern traditions, it is the core of spiritual practice. Why? It’s partially a matter of semantics. The Sanskrit word for breath is *prana*, but *prana* also means “life force” or “vital energy.” In the Hindu and Taoist tradition, the breath is also a metaphor for “spirit” and “soul.” Thus, by regulating your breath, you deepen your spirituality. Buddhism shifted the focus to the mind and devised breathing meditations that would give you greater control over mental and emotional states. This, it turns out, to be neurologically effective. In Eastern traditions, developing consciousness and mental control are genuine spiritual pursuits, and it all begins with the breath.

1. Sit down in a comfortable chair, in a quiet place where nothing will disturb you for the duration of the exercise. Rest your hands in your lap, and uncross your legs, placing your feet flat on the floor.

2. Now, do nothing more than pay attention to your breath. Breathe in slowly through your nose, and notice the cool temperature of the air.

3. Now, slowly exhale through your nose. Notice the temperature as you breathe out. How warm is it as you breathe out?

4. Continue to slowly breathe in and out through your nose ten times, and notice how the sensations change. Take nice, slow, deep breaths in and out. Try not to think about anything other than your breath.

5. If your mind wanders, don't get frustrated, just return to focusing on your breathing in and out. Notice, too, how focusing on your breathing affects your thoughts. Notice each thought or feeling, then immediately return to your breath.

6. Now, shift your focus to your chest, and feel how it rises and falls with each breath you take. Slowly breathe in to the count of five, then slowly breathe out to the count of five. Do this ten times and then return to your normal breathing. Notice how it has changed, and notice if it feels different. Are your breathing slower? Or deeper? Or more shallow? How far down into your lungs can you feel the coldness of the air? Take another five breaths and notice how the sensation in your lungs begins to change.

7. Now shift your attention to your abdomen. Take a deep breath in to the count of five, and watch how your chest and belly moves. Which moves first, your chest, or your belly? Does your belly expand when you breathe in, or contract? Take ten more breaths and watch how it changes the movement in your abdomen and chest.

8. Now return to your normal breathing, and listen to the sounds in the room. Do they seem more intense? Notice how many different sounds you can hear, both inside and outside your body. Once more, return your awareness to your body. Does it feel more tense or relaxed? Does it feel more warm or cool? Are there any parts of your body that seem tense or uncomfortable? Just notice the tension, and take another deep breath through your nose.

9. Now, slowly breathe through your mouth. Notice how this changes the movement of your belly and your chest. Repeat this deep breathing ten times, counting the seconds as you breathe in, and counting the seconds as you breathe out.

10. Shift your attention to your mouth and feel the cold air across your tongue as you breathe in. Now feel the warmth when you breathe out. Shift your attention to roof of your mouth, and notice how different the temperature feels. Return to your natural pattern of breathing and notice any differences you feel. Are you more relaxed, or more tense? Do you feel more tired, or awake? Whatever you are feeling, don't judge it. Just notice it and accept it, and return to watching your breath.

11. Now bring this exercise to a close. Slowly look around the room, turning your head from one side to the other. Then slowly rise from your chair. Take a moment to see how you feel standing up, and consciously breathe in and out. Slowly start to walk, and see if you can continue to be mindful of your breath.

You can do this whole exercise in just a few minutes or for as long as 20-30 minutes. The longer you do it, the more intense the sense of peace and relaxation you can



achieve. This practice trains your mind to be still, but neurologically it is in a heightened state of awareness—the perfect state in which to set about on the tasks that you need to do. As you become more familiar with breathing awareness, feel free to vary it in any way you like, combining it with any of the following exercises, or just watching how your mind responds as you consciously breathe in and out.

### **Exercise #2: Deep Yawning**

Now that you have had the experience of “mindful” breathing, I want you to compare how yawning affects your awareness, alertness and bodily relaxation. Even though I enticed you to yawn in the previous chapter, I’m formalizing it here because it is so important for your brain. Yawning will physiologically relax you in less than a minute, and this allows you to move more rapidly into other meditation states. Make it a habit to consciously yawn five or six times a day. Start the exercise by doing the following:

1. Find a quiet comfortable place where you won’t be disturbed by others. Stand in a place where arms are free to swing side to side. You can sit, but standing allows you to achieve a fuller inhalation.
2. Begin by taking a very deep breath and stretching your mouth wide open. Don’t worry if you don’t feel like yawning, or don’t believe you can. Just use your memory and fake a series of yawns. Continue faking them and pause briefly after each yawn. By the fifth or sixth one, you’ll feel a real one coming on.
3. Pay close attention to what happens in your mouth, your throat, your chest and belly, and don’t be surprised if your eyes start watering.
4. You should allow yourself about 12-15 yawns with a few second pause in between each one. The total time for this exercise should be about 2 minutes.

If you really have trouble yawning, get together with a family member or friend. Yawning is one of the most “contagious” activities, and if you hear and see someone else yawn, it will neurologically stimulate the same response in you.

Conscious yawning generates a deep sense of relaxation, calmness, and alertness, and as we detailed in the previous chapter, it stimulates a unique circuit in the brain that enhances self-reflective consciousness, the key to any contemplative or spiritual practice. Yawn before you tackle a difficult problem, and yawn when you find yourself in a conflict with another person. If you do aerobic exercises, yawn at various times and you may feel an immediate improvement in motor coordination. Yawning will help reduce stress, literally in a matter of a couple of minutes.

### **Exercise #3: The Relaxation Response**

Dr. Herbert Benson at Harvard made this meditation famous thirty years ago, and is one of the most researched techniques in the world. Today it is used in hundreds of stress reduction programs throughout the country, generating neurological and psychological states of serenity and health.<sup>324</sup> You simply focus on a word, phrase, or mantra—love, peace, God, aum, etc.—that makes you feel happy, peaceful, or calm, and you repeat it as you breathe slowly and deeply. Or, if you prefer, you can recite a brief passage from a sacred text.

All that matters is that you find it personally meaningful and relaxing, and it doesn’t matter which religious tradition you choose. In one intriguing study, equal benefits were obtained by those who used “Om Mani Padme Hum” (Buddhism), “Rama, Rama” (Hinduism),

“Lord have mercy (Christianity), or “Shalom” (Judaism).<sup>325</sup> In fact, mere repetition of any positive phrase will reduce stress, anxiety, and anger while simultaneously improving one’s quality of life.<sup>326</sup> This exercise has been adapted from Dr. Benson’s work:

1. Find a comfortable place to sit where you won’t be disturbed, and close your eyes.
2. Take several deep breaths, and as you exhale, silently, or with a whisper, say a word, phrase or sound that gives you a feeling of serenity or joy (“peace,” “love,” “slow down,” “relax,” “aum,” “God,” etc.).
3. Stay with your breathing and the repetition of your personal mantra. Repeat the mantra slowly with your breathing for about 10 minutes.
4. If unwanted thoughts or feelings intrude, acknowledge them and let them go, returning to the repetition of your mantra. Don’t try to achieve a particular goal or state; just keep focusing on your word for the full 10 minutes.
5. When you finish, sit quietly for a few moments and then open your eyes. Notice how you feel, yawn three times, and slowly move about the room.

If you do this exercise once or twice a day, you will notice, in just a few weeks, significant shifts in your awareness and behavior. You’ll feel calmer, less anxious, and more receptive. You may even find that you lose some of your desire to smoke, drink, or overeat. Feel free to change your mantra as often as you like, paying attention to how different concepts affect your awareness in different ways.

#### **Exercise #4: Progressive Muscle Relaxation**

Some people have a very difficult time using their mind to relax their body, so I often use this technique, which was developed in the 1920s by the American physiologist Edmund Jacobson. I call it the “heavy artillery” of relaxation training because it particularly effective with people who are unusually tense. It is useful in reducing stress and anxiety, helping with pain, fibromyalgia, heart disease, and a variety of neurological, psychological, and physical disorders.<sup>327</sup> It has also been effectively used to help people relax before operations, and it speeds up post-operative recovery.<sup>328</sup>

Progressive muscle relaxation was the first technique I ever tried on other people. When I was in junior high school, I did a report on progressive muscle relaxation, so I experimented on my whole class. They all loved it, and one person even fell asleep (but then, that wasn’t so unusual in my school). Which reminds me: many people report that this exercise, when practiced before going to bed, helps them fall asleep. In fact, studies have shown that progressive muscle relaxation is just as effective as taking a variety of sleep-inducing medications.<sup>329</sup> And, if you pair it with music, the effects appear to be enhanced.<sup>330</sup>

Progressive muscle relaxation is easy to do. Essentially you tighten and then relax each muscle group in the body and in between, you take a nice deep breath or yawn. The exercise is best done lying down, on a thick carpet or mat, but you can do it in any large well-padded chair. I also recommend that you have someone read this to you if you are especially tense, or make or purchase of recording. But for this moment, try to do as many steps as possible as you read.

1. First, take a really deep breath, hold it as long as you can, then breathe out as much air as possible. Again, hold your breath as long as you can before inhaling. Repeat this five times.

2. Next, take a deep breath in, and as you do this, tense all of the muscles in your body, from head to toe, and hold it as long as possibly can (most people can do this for about 10-20 seconds). Then relax everything, expelling the air from your lungs. Do this three more times. Then breathe out and relax all the muscles in your body.

3. Take another deep breath, and starting at the top of your head, tighten up all of your face, then let it go as you breathe out.

4. Breathe in deeply, scrunch up your forehead and hold it for five seconds. Then release, breathing out.

5. Breathe in, tighten your mouth and jaw, hold it for five seconds, and release as you breathe out. Now stretch your mouth open as wide as you can. Hold it for five seconds, and release. Take another deep breath and yawn, and release all of the tension in your face.

6. Take a deep breath in, pull your shoulders up toward your head, and tighten all of the muscles in your neck. Hold for five seconds, then push your shoulders way down as you exhale. Slowly roll your head from side to side as you fully and completely relax.

7. Take another deep breath in and tighten your arms and your hands. Clench your fists tightly hold them tight for as long as you can. Breathe out and relax your arms and hands. Breathe in, push your arms into the chair or floor, hold for ten seconds, and release, breathing out. Shake out your hands and arms, then take another deep breath. Yawn, and take a few moments to sense the relaxation in your upper body and face.

8. Next, take in a breath and tighten your abdominal muscles. Hold it for a count to ten, then relax, pushing out all of the air from your lungs. Push your stomach out, pull it in, push it out again, and then let all of your tension go. Repeat the pushing and pulling ten times.

9. Take another deep breath, and tighten your buttocks. Hold as long as you can, then breathe out and relax. Breathe in, tighten your upper legs, quickly relax as you breathe out. Breathe in, tighten your calves, hold for five seconds, then release. Breathe in again, scrunch up your toes, hold, and release, then stretch them upward and apart as you slowly breathe out all of the air in your lungs. Now shake you feet and legs as fast as you can for another ten seconds, then rest.

10. Yawn, and spend a few moments feeling the relaxation flowing through your legs. Once more, take a huge breath in, tighten your entire body, hold for ten seconds, then release as you force all of the air out of your lungs.

10. Do a body scan: feel how relaxed your face is . . . then your neck . . . your shoulders . . . your arms . . . your chest . . . your abdomen . . . your back . . . your legs . . . and finally your feet. Lie there for a few minutes and gently stretch.

11. When you feel ready, slowly stand up, and slowly walk around, feeling how each part of your body moves. But take it easy for a few minutes – you are very relaxed at this point, and your consciousness may be in a very altered state of awareness.

## **Exercise # 5: Visualization and Guided Imagery**

Even if you don't think you're good at visualization, your brain is built to envision virtually everything in the universe. Even abstract notions like peace are processed unconsciously within the visual centers of the cortex. In fact, the more you visualize a spiritual or emotional state, or a specific goal in life, the easier it will be for your brain to bring that intention into your inner and outer reality.

Guided imagery simply refers to the process of using pleasant visions and memories to induce a deep state of relaxation, and it has been proven to be very effective in reducing pain.<sup>331</sup> . It effectively lowers anxiety and depression in people before and after they undergo a medical or surgical intervention,<sup>332</sup> and if you visualize a positive outcome prior to surgery, you'll have a better recovery.<sup>333</sup> Guided imagery and visualization will even buffer the effect of stress on the immune system, making you less susceptible to viral infections.<sup>334</sup>

In a recent brain-scan study that I just completed, guided imagery reduced the symptoms of patients suffering from post-traumatic stress disorder by lowering activity in the emotional centers of the brain and raising activity in the areas that allow us to voluntarily control our feelings and thoughts.<sup>335</sup> Thus, guided imagery techniques can help individuals deal with trauma, as well as a variety of physical and mental illnesses. In fact, a recent fMRI study conducted at Yale University found that visualization and guided imagery stimulate almost the exact same areas in the brain that our meditation subjects activated when doing Buddhist, Christian, and Sikh meditation techniques.<sup>336</sup>

To experience the benefits of visualization, choose any place—imaginary or real—that feels beautiful and relaxing: a beach, a mountaintop, a waterfall, a sailboat on a lake. Now, pretend you're watching a movie. Can you see yourself there? Can you slowly turn around and visualize the tiny details on the ground and in the sky? If you are at work and you are feeling especially pressured and tense, you can take a three minute “vacation” to calm the neural dissonance in your frontal lobes by simply recalling a pleasant memory. If you wish, you can visualize a loved one, or a romantic scene. Let your fantasies take you to wherever they want to go. And, if you find that you have trouble visualizing, yawn a dozen times, because it stimulates an important part of the self-visualization process in your brain. Remember, imagination is what the frontal lobes do best, and pleasurable fantasies are like desserts, completely calorie-free.

See how well you can visualize the following scenario, commonly used in self-hypnosis, guided-imagery therapy, and stress-relaxation programs.

1. Find a quiet place to lie or sit down. Close your eyes and take five deep breath, followed by four or five yawns. .
2. Take another deep breath, and visualize yourself lying on a warm, sunny beach. Feel the sun radiating through your skin and warming the muscles underneath. Feel yourself sinking into the warm, soft sand as you become more and more relaxed. Take another deep breath, and feel yourself melting into the beach. Stay with this image for two or three minutes, and let your imagination take you to wherever it wants to go.
3. Now, imagine yourself walking through a thick, humid, tropical forest. Take a deep breath and feel the warm damp air blow across your face. Visualize the path, surrounded by lush, green, tropical plants. Can you hear the birds

chirping quietly in the trees? What do they sound like? What do they look like? What colors do you see?

4. As you walk down the path, you come around a bend. There, in front of you, is the most beautiful waterfall in the world. Watch how the water spills down the side of the mountain, over the rocks, and into a crystal clear pool of water.

5. Now step into the pool. Take a deep breath and Feel the warm tropical water washing over your feet as you slowly step into the waterfall. Feel the clear, warm water gently flow over your head, washing away all of your tension and cares. Take three deep breaths, and with each exhalation, let the water wash all of your worries away.

6. Now feel your body melting into the pool. As you breathe in deeply, you feel yourself turning into a stream. As you and the water become one, you begin to slowly flow down the stream. Feel the sun shining overhead as you float down the river, far, far away from all of the tensions of the world. Watch where the river takes you, and continue the inner journey as far as it wants to go. When your journey is finished, notice how relaxed you feel.

When creating your personalized “vacation,” or when guiding a friend through these visualizations, remember to use repetitive words and phrases that evoke relaxation: “warm,” “soft,” “deep,” “heavy,” etc. For example, tell yourself that you are “feeling *more* and *more* relaxed...going *deeper* and *deeper* into relaxation...arms feeling *warm* and *heavy* and *relaxed*...” The repetition lulls you into a trance-like state of peace.

You can even use visualization and guided imagery with your children. At the pain management clinic at Children’s Mercy Hospital in Kansas City, researchers found that a combination of guided imagery and progressive muscle relaxation was more effective than breath-based relaxation techniques when working with children who suffered from abdominal pain and discomfort.<sup>337</sup> This is why we recommend that you combine as many techniques as you feel comfortable with if you want to achieve the greatest effect.

Visualization is an important aspect for setting any goal, since much of your unconscious brain is oriented around a visual construction of the world. If you want to do better in sports, many studies have confirmed that visualizing your performance actually improves your game.<sup>338</sup> The same is true for work. If you visualize a possible solution to a problem, the problem is more easily solved because it specifically activates cognitive circuits involved with working memory.<sup>339</sup>

Visualization helps us to distance ourselves from a disturbing memory or problem, yet it simultaneously brings us closer to our desires. Thus, if you envision a sacred object like God, it pleurably reinforces your religious beliefs. You can visualize yourself being a better golfer, or you can envision yourself as being a more spiritual person, but in either case, your neural connections will to help you actually achieve those goals. Finally, you’ll find many excellent books that are filled with guided imagery exercises that will help you to reach very deep states of relaxation.

## **Meditation and Prayer**

The five exercises we have just described represent the core elements for remaining relaxed and alert. If you did nothing more than 15 minutes a day of any combination of the above, you’ll improve your health and lengthen the span of your life. That, in itself, is a big deal,

but we want to encourage you to go further by incorporating one or more of the following traditional meditation techniques because these are the ones that can make profound and permanent changes in your consciousness and your fundamental perceptions of the world. Our research has shown they enhance memory, cognition, and attentiveness, and they appear to slow down the aging process. Most important, they significantly lessen stress.

Three of the meditations below (Centering Prayer, Walking Meditation, and Sitting with the Demons) are variations of what are sometimes called “mindfulness-based” meditations or “acceptance-based” therapy. Mindfulness-based exercises have been widely studied and have been found to help people with depression, anxiety, high blood pressure, psoriasis, trauma, eating disorders, substance abuse, and a variety of psychopathological behaviors.<sup>340</sup>

In fact, most forms of meditation and intensive prayer practices have been shown to help people with a wide variety of psychological and physiological problems, including attention deficit disorder, liver disease, HIV, and cancer. Obviously, meditation practices were not originally developed for these purposes. Instead, they were designed to create feelings of self-awareness, peacefulness, compassion, and spiritual enlightenment.

Even if you did nothing more than this for ten or twenty minutes a day, permanent changes in your brain will begin to occur. You will improve your ability to concentrate, and you will lower neurological and physiological stress. It begins as a brief feeling of serenity, but as the practice continues, subtle shifts in sensory awareness begin to occur.

Research also suggests that meditation is the most effective tool for exploring and generating spiritual experiences. In fact, from a neuroscientific perspective, it consistently takes the practitioner into deep states of consciousness. When compared to everyday awareness, the brain, during meditation, is operating in a very unusual way. And, since the underlying mechanics of meditation are theologically neutral, it can be integrated with any religious doctrine or creed, or used in schools to improve social cooperation and cognitive performance.<sup>‡‡</sup>

Today, meditation comprises a huge group of practices that range from the deeply spiritual to the completely secular. Even the exercises we have described above could be categorized as meditations, depending on how loosely you define the term. Some meditation practices involve the repetitive focus on a particular object, while others involve the neutral observance of the thoughts and feelings produced by the mind. There is even a technique called *emptiness meditation*, which we will tell you about later.

Most meditations begin by calming the mind through relaxation, breath awareness, or maintaining one’s focus on a specific object or thought. Then they progress to the more complex strategies of watching one’s feelings and thoughts. In advanced stages, different meditations might focus on a variety of philosophies or esoteric goals (developing forgiveness, enhancing sensuality, dissolving the self, merging with the cosmos, expanding consciousness, becoming one with God, etc.).

In fact, there are so many meditation techniques to choose from that the trick is to find the one that resonates best with who you are, and what your specific goals might be. A meditation that is spiritually based might be great for a religious person, but not an atheist. Some people might like meditations that involve movement (like yoga), while others may prefer a meditation that integrates mantras and prayers. So if you try a meditation program and you don’t

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<sup>‡‡</sup> Whereas prayer is not allowed in the public school system, meditation, when stripped of any religious overtones, has been introduced, but often with considerable controversy, since some people still associate it with Eastern spiritual traditions. If meditation is framed in the language of stress reduction, focused attention, or awareness enhancement, the church/state obstacle can be overcome.

like it, don't reject the other types. Somewhere, out there, is the perfect one for you. Pick one that is consistent with your personal, ethical, and spiritual beliefs, and integrate those beliefs into every exercise you do. And if you choose to work with a meditation teacher, make sure you find out what his or her underlying philosophy is about.

### **Exercise #6: Candle Meditation**

This first exercise is considered a concentration meditation, and neurologically it is designed to interrupt endless stream of chaotic thinking that normally occurs in the frontal lobe. Ideally you should do this in a darkened room, but it isn't essential for the practice.

1. Begin by placing a candle that will burn for 15 minutes in a safe holder, on a dining room table or coffee table, close to a comfortable chair. Smells can augment meditation experiences, so a scented candle may be used, is fine. Sit down, with feet flat on the floor, with a lighter or matches in your hand.

2. Take a few deep breaths, and yawn, just focusing on the unlit candle. Then, in slow motion, light the candle, and take another deep breath of air. Slowly put the lighter down, and sitting up straight, begin to gaze at the candle. Blink as little as possible. Even though your eyes may water, this is good, since your tears will help to cleanse your eyes.

3. Bring your focus to the flame. Let it fill your entire consciousness as you observe how it dances and flutters. What colors does it make? Does the flame grow taller, then retreat? Keep watching all of the qualities of the flame for three or four minutes.

4. If interruptive thoughts come into your mind, just let them be there, acknowledge them and let them go, and bring your focus back to the candle flame.

4. Now close your eyes, and visualize the flame in your mind. Watch how it dances and flutters in your imagination. If the image of the flame fades, open your eyes, study the flame, then close your eyes again. Keep doing this until you hold the image of the flame in your mind for five minutes with your eyes closed

That's it! It's simple, powerful and enjoyable. Each time you do the meditation, try extend the time. In some practices, you use your imagination to become one with the candle. To do this, you imagine that the flame is coming closer and closer to your closed eyes. Then you imagine that you are inside of the flame.

In another variation, you imagine that the flame is burning away all of your thoughts, desires, and problems: anger, stress, impatience, greed, etc. You can also use other objects—a pretty rock or a crystal, an autumn leaf, or even a common item like a pencil—to immerse your attention upon. Many people use this exercise as a prelude before doing other types of meditation.

### **Exercise # 7: The Centering Prayer**

When we brain-scanned a group of Franciscan nuns, they used the Centering Prayer, a contemplative method that was first described in the 14<sup>th</sup> century text, *The Cloud of Unknowing*.<sup>341</sup> According to Friar Thomas Keating, one of three Trappist monks who reintroduced this technique to the Catholic community in the 1970s, it brings the practitioner

“into the presence of God” by “reducing the obstacles caused by the hyperactivity of our minds and of our lives.”<sup>342</sup>

This meditation is very similar to various forms of Eastern contemplation, and, as we discovered in our lab, the neurological effects of the Centering Prayer are nearly identical to the mindfulness practices in Buddhism. It is also similar to Benson’s relaxation response, which I described above, but the goal is different: to feel connected, immersed, and unified with the object of your contemplation. The nuns, their goal was to feel closer to God, but for the Buddhist practitioners, they wanted to experience pure consciousness—an intense state of thought-free awareness of the world.

In a Centering Prayer, like other forms of mindfulness meditation, you are not concentrating on a single object or thought, nor do you repeat an expression or a phrase. Instead, you allow your mind to reflect on all the qualities associated with particular idea, and you allow the thoughts and feelings to freely flow through your mind, taking you where they will.

As you engage in this form of meditation, you don’t try to analyze the experience. You just let it unfold. There is no specific goal other than observation. You don’t try to make your mind blank, and you don’t even aim for peace. However, if you want to have a unity experience, it usually takes 40 minutes or more, and perhaps many months of practice as well. Still, I suggest you try, because it has been my premise that this type of practice brings one closest to experiencing a mystical or transcendent state.

For the purposes of this book, I have slightly modified the Centering Prayer so that you can adapt the meditation to your specific faith or goal. The original version, as developed for Catholic practitioners, can be found at [www.centeringprayer.com](http://www.centeringprayer.com). Begin by finding a comfortable place to sit where you will not be disturbed for twenty minutes.

1. First, identify what your objective is (finding inner peace, experiencing compassion for others, receiving the gift of God’s presence, etc.) Or, if you prefer, you pick a particularly meaningful quote, poem, or passage from a sacred text such as the bible.

2. When you have found a concept or passage that you wish to explore on a deeper, intuitive level, sit down in a comfortable chair. Close your eyes, breathe slowly and deeply, and then yawn to make sure all of your tensions are gone

3. Now focus your awareness on your selected object of contemplation. Do not repeat any words or expressions to yourself. Just be aware of all the thoughts, perceptions, feelings, images, and memories that your contemplation evokes.

4. Notice how you are feeling. Are you happy? Joyful? Sad? Now bring your attention back to your goal, and again watch what feelings and thoughts emerge.

- t. If your mind wanders too far away, gently return your awareness by taking several deep breaths, bringing your focus back to the phrase or prayer. Again, let your thoughts take you wherever they want to go.

6. If the object of your contemplation becomes vague or disappear; simply watch what happens next. Don’t “do” anything or “make” anything happen—just let the experience naturally unfold. After several minutes, again return to the object of your contemplation. Do not choose to focus on a different phrase or prayer. Instead, the contemplation work on you.



8. Continue this process for a minimum of twenty minutes. Then slowly open your eyes. Remain silent for two more minutes, while you take slow, deep breaths and yawns.

It is helpful to have a muted timer to let you know when twenty minutes have passed. During long meditations, you will notice pains, itches, twitches, and periods of restlessness. Observe them the best you can, but if you feel impelled to move around or scratch, give yourself permission, then take several deep breaths and return to the meditation practice.

The worst thing you can do in meditation is to critically judge your performance—and yet you'll find that there's a little critical voice inside of all of us that is constantly judging every little thing we do. Meditation practice teaches us how to be accepting of who we are, of weaknesses as well as our strengths. Remember: self-criticism stimulates the amygdala, which releases a myriad of stress-provoking neurochemicals and hormones.

### **Exercise #8: Walking Meditation**

Another important step (literally!) of meditation is to bring your awareness and relaxation into the world through action. By walking and your focusing on your breathing—along with an awareness of the world around you—you can achieve a very calm and balanced state at work, and in relationships with others. In particular, this state allows you to actually experience the world in a very pleasant and engaging way. You'll even perceive the world more intensely than in your usual state of mind. Since walking is a well established technique for enhancing physical fitness, walking meditation has the added benefit of providing a mild form of exercise, which may be especially beneficial for people with heart and lung disease. There is even evidence to suggest that it can enhance memory, attention, and quality of life,<sup>343</sup> as well as delaying the effects of age-related disorders.<sup>344</sup> Since we all have to walk at least a few minutes every day, why not make it a part of your daily brain-enhancement program? All you need to do is to bring attention to the act of taking a single step.

The following exercise integrates a traditional Buddhist walking meditation with Feldenkrais's "awareness through movement" techniques. Feldenkrais's work is, in essence, a mindfulness meditation, and research has shown it to be effective for enhancing mood, pain, self-awareness, and overall health.<sup>345</sup> In fact, just imagining that your movements become more flexible<sup>346</sup> significantly increases the flexibility and coordination in that part of the body you are focusing on. Why? Because the motor cortex is highly interconnected with the imagination-processing centers in the frontal, occipital and parietal lobes.<sup>347</sup> In other words, our thoughts and behavior are inseparably intertwined.

The exercise appears simple, but it really requires concentrated attention and awareness, so watch out for that inner critic who is always in a rush. Walking meditation will drive that sub-personality nuts.

1. First, find a place where you can walk for about ten or twenty paces. A long hallway will do, or a lawn or open park, but try to find a quiet and pleasant place, like a garden.

2. Stand up (you can hold this book in your hands as you follow these instructions), and gently shift your weight back and forth between each foot. But really take your time. Notice at what point the heel of one foot comes off the

ground, and notice how your weight shifts onto the various parts of your other foot. Do you have more weight on the balls of your feet, on the side, or on your heel? Continue to shift your weight back and forth for at least 60 seconds.

3. Now shift your weight forward and backward, and notice what happens in your toes. What does your big toe do as you move? Your little toe? Repeat this for another minute.

4. Continue to shift your weight forward and backward, but turn your attention to the part of your body that makes you shift. Is it in your ankles? Your calves? Your hips? Notice how hard it is to identify where the movement comes from, and continue to rock for another minute.

5. Next, in ultra-slow motion, begin to take a single step forward. But only lift your heel a couple of inches. In which muscle does the step begin? In your foot, or leg, or knee? Raise your heel 10 times.

6. Now change to the other foot and lift your heel another 10 times. Notice how different it feels. Now shift your attention to your knee, and notice how it feels.

7. Slowly, *very slowly*, lift your foot a few inches from the ground, and pay attention to all the subtle body adjustments that must be made for balance. Lower your foot and raise the other foot two inches. Continue to alternate 20 times as you study which parts of your body are involved. What happens in your hips? How much does your body sway? How does it make you feel to move so slowly and deliberately? Notice any judgments, take a deep breath, and let them go.

8. Now begin to take slow steps forward, taking four steps with every breath in, and four steps with every breath out. After a few minutes, take three steps with each inhalation and exhalation. Do this for another two minutes, then try taking only two steps as you slowly breathe in, then take two more steps as you exhale. Practice integrating your breathing with your walking for the next five minutes, walking as slowly as you can.

9. When you reach the end of the hall or yard (or after about 20 steps), turn around in ultra-slow motion. Take two minutes to turn around, watching how your balance works, then slowly walk back to where you began.

At first, each step will feel uncoordinated, but the more you become aware of how your feet, legs, hips, back, and shoulders move, your steps will become more fluid. This is an ideal meditation to do after a sitting meditation, and for many people, it's so intriguing that they can do it for a half hour or more.<sup>§§</sup> The longer you practice, the more you'll become aware of: the texture of the ground, the colors of the grass, the sound of people talking, and the exquisite movements of your body. Whatever you perceive, focus on it, and then come back to your breathing and take another step.

And don't forget to smile while you walk. As the Buddhist teacher Thich Nhat Hanh said, "Your half-smile will bring calm and delight to your steps and your breath, and help sustain attention. After practicing for half an hour or an hour, you will find that your breath, your steps, your counting, and your half-smile all blend together in a marvelous balance of mindfulness."<sup>348</sup>

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<sup>§§</sup> You can also order a book/CD/DVD combination by Nguyen Anh-Huong and Thich Nhat Hanh (Sounds True, 2006) demonstrating three different forms of walking meditation in nature and in public places.

You can apply this same slow-motion meditation to other daily activities, such as eating or getting in and out of a chair (this, by the way, is an amazing experience to do slowly). For example, in many university stress-reduction programs, you'll be handed a single grape with which you must spend several minutes becoming aware of its texture, weight, smell, and taste. It literally makes that grape come alive.

To really appreciate the power of walking meditation, do it with your partner or a friend. And with just a little practice, you'll find that you can take your relaxation with you anywhere. From a spiritual perspective, walking meditation also encourages you bring your inner values into play with the world, thus helping you to experience daily life with greater depth and unity.

### **Exercise # 9: Memory Enhancement**

The Sikh meditation that our memory-impaired patients used (see Chapter 2) is more of a concentration and repetition ritual than a form of mindfulness. It includes four different sounds that are sung, not said, and while this happens, you touch different fingers with each sound. The addition of movement and singing to any meditation appears to significantly enhance the cognitive performance of the brain.<sup>349</sup> Neurologically, there are both similarities and dissimilarities, which is not surprising, considering that it uses a complex movement ritual (a mudra, in Eastern terms) that activates a variety of motor and cognition centers in the brain. Our research suggests that the more complex you make your meditation, the more you enhance additional functions in the brain. Indeed, there are some esoteric meditations, like those practiced by the Sufi whirling dervishes, that require so much skill that we would expect to find very enlarged circuits in distinctive areas of the brain.

Our subjects sang the sounds SA, TA, NA, and MA as they touched each of their fingers with the thumbs of each hand. Take a moment right now and try it right now, but don't be surprised if you feel a little odd at first. I did when I first tried it, and so did some of our patients. Touch your thumb and index finger when you say SA, your thumb and middle finger when you say TA, your thumb and ring finger when you say NA, and your thumb and pinky when you say MA. Now you are ready to begin.

In the Sikh tradition, each sound has a specific meaning that relates to the overall cycle of life or existence. For example, SA refers to birth, infinity, or cosmos; TA means life or existence; NA relates to death or completion; and MA means rebirth. During the exercise, these sounds are repeated over and over in order. When we taught our memory patients, we did not emphasize the spiritual meanings of the sounds. And, based upon an overview of mantra meditation research, we are certain that the meanings have little effect on the neural enhancement of cognition. Thus, you are free to substitute the sounds for any other sound or word that has meaning to you. But for the moment, we'll teach you the technique in the same way we instructed our subjects. In our study, the sounds were sung out loud to the notes of A, G, F, and G (you can find them on a piano, guitar, or other instrument). However, different Sikh traditions sing this meditation using different notes (to hear a traditional chant, and the meanings attributed to the Sikh sounds, go to [www.100megsfree.com/yoga/statnama.html](http://www.100megsfree.com/yoga/statnama.html)).

1. Start by finding a comfortable place to sit where you can sit upright with good posture. Take two minutes to focus on your breathing, watching how your chest rises and falls.

2. Begin singing the sounds: SA, TA, NA, MA while you touch your fingers in succession on both hands. Continue for 2 minutes.

3. Next, repeat the sounds in a whisper while continuing the finger movements. You can still sing it, but just in a whisper. Do this for another 2 minutes.
4. Now, repeat the sounds internally. Say them silently to yourself while continuing the finger movements, and do this for 4 minutes.
5. Repeat the sounds in a whisper for another 2 minutes as you continue to touch your fingers on both hands.
6. Finally, sing the sounds out loud for the final 2 minutes as touch your fingers in succession. Then rest and pay attention to how you feel.

Will your memory improve? Our research suggests that eight weeks of practice creates at least a 10% improvement. But the improvement may come from the *intention* of seeking memory enhancement. However, since other meditation studies have shown a wide range of cognitive enhancements, we suspect that it is the underlying nature of the practice itself that works: intention, relaxation, and awareness—and the willingness to practice every day.

Since complexity is an important key to neural enhancement, we recommend that you create variations on this meditation. Mark, for example, used the basic structure to hike in the mountains. He chose four words—peace, happiness, compassion, and joy—and touched each finger as he said the words out loud as he walked. Then he took each word, and spelled them out on his fingers. With “peace,” after he touched his four fingers, he touched his first finger again when he got to the letter “e.” Then he spelled it again, starting with the second finger. If you try it, you’ll see that it requires intense concentration, but that too, is key to making neurological changes in the brain. The point I want to make is that you can modify any meditation to suit your interest or needs, and it will still enhance the overall functioning of your brain.

### **Exercise #10: Sitting with Your Demons**

Chronic negativity is cognitively, emotionally, relationally, and spiritually destructive. In fact, no other emotion is more difficult to control, or more likely to interfere with your meditation practice, than anger. So I want to offer you several meditation and visualization techniques to help transform irritability into love.

Anger is a defense that we are born with, but it is an enemy to dialogue, empathy, and trust. Until it subsides, we cannot negotiate or communicate our needs, nor resolve a conflict with ease. In relationships, anger seems to pose a double bind: if we express it openly, we stimulate defensive neural circuits in the other person. Thus, whoever gets angry first (even if it is disguised behind a contemptuous frown) will lose the argument, even if your position was right. The only way out of this dilemma, the experts say, is to become intimately familiar with this destructive emotion and its many hidden forms: jealousy, pessimism, prejudice, cynicism, sarcasm, criticism, selfishness, etc. We have to watch it and study it—in other words meditate on it—if we want to uncover the feelings it may hide. As Steven Levine wrote:

Rather than pushing [such feelings] down or spitting them out, we can let them come gently into awareness. We can start to give them space, to get a sense of their texture, of their voice, of their inclination. We begin to investigate the nature of *the* anger instead of getting lost in *my* anger.”<sup>350</sup>

When dealing with anger and frustration, researchers have found that meditation, imagining volatile scenarios, and deliberately suppressing negative thoughts were equally effective in diffusing anger.<sup>351</sup> Deliberately substituting positive thoughts for negative ones is another effective strategy.<sup>352</sup>

If the anger is not severe, mindfulness meditation is one of the most powerful ways to work through this destructive emotion.<sup>353</sup> When we meditate upon the demons within, we become more observant and relaxed, allowing us to go deeper into our emotions without losing control. Thus, we can safely experience our anger more fully, with greater detachment and clarity, and without expressing it to others. It may feel good at the moment to express anger, but hundreds of converging studies in psychology and neuroscience now confirm that the expression of anger only generates more of the same.

The only trick is to *remember* to meditate when you are angry, because anger interferes with nearly every cognitive process in the frontal lobes. That's why we want you to try this exercise now, when you're not angry, so that it will be in your memory when you find yourself caught up in irritability, self-criticism, or frustration toward someone else. As with the other exercises, find a quiet place to sit, where you will not be disturbed by others or by the phone.

1. Take 10 deep breaths, even if you don't feel like it, followed by 10 fake or genuine yawns.

2. Recall a time from the past when you were very, very mad at a specific person. Picture the person's face in as much detail as you can, and spend a minute thinking about the things that made you angry. Take three more deep breaths and deepen the intensity of the memory. Tighten your jaw, tighten your fists, hold them for ten seconds, and then let them relax.

3. Allow yourself to remember the feelings of anger that you felt inside. Where do you feel the anger now? In your head? Your chest? Your belly? Take a deep breath and let your emotions take you in any direction they want.

4. Observe your feelings like you were watching a movie. Notice each feeling, and label each one with a simple word or phrase: "I feel angry and hurt," or simply "Anger. . . doubt. . . hurt . . ." Say it out loud, then let the feeling go and return to your breathing. Watch what the next feeling is and give it a label. Then let it go. Do this for three minutes, and after each minute of observation, note how you are feeling, then take a deep breath and yawn. The internal dialogue might sound something like this: "Anger - anger - sadness - pain - I feel like running away - I want to lash out and hit - I want to run away - I don't care that I'm angry - this meditation is stupid - I'm not getting anywhere with this - now I'm really sad - ah, the feeling is fading - no it isn't..."

5. If your mind wanders to some other topic, simply take another deep breath and refocus on your angry memory. Notice if your feelings begin to change, but do not judge yourself.

6. Next, ask yourself if you have ever felt this kind of anger before, and make a mental "list" of all the times you can recall. Is there a person from kindergarten that you can recall being angry at? Visualize that person and say aloud his or her name, if you recall. Now do the same thing with first grade, second grade, third grade, fourth, fifth, sixth, seventh, and eighth. Now high school: how many people do you recall being angry at when you were an

adolescent? Say their names, take a deep breath, and let the memories and feelings fade away.

7. Now shift your attention to your family. Does the anger you feel at the moment remind you of a specific incident with your mother? Your father? A sibling? Take another deep breath and let these memories fade away..

8. Compare your anger to recent memories. Think about the last time you got angry. How does it make you feel now? Once more, take a deep breath and let those feelings go..

9. Yawn five times, and note how your feelings have changed. If the anger is still there, don't judge it, condemn it, or condone it. Just accept it as a natural feeling inside.

The next time you feel angry toward someone, set aside ten minutes and improvise on the exercise above. Visualize the person's face. Watch where in your body you experience the anger, and use your breathing to explore all the memories of anger associated with that individual. For some people, this may take you far longer than ten minutes, but it's important to see how deep they run. See if the anger you feel reminds you of different people in the past, and take a few minutes to make a mental list of their names.

Often your anger will subside by observing it, but sometimes negative feelings run very deep, and they will not go away by meditating on them. But that is okay, because the practice trains your mind to slowly disconnect from your feelings. Simple observation is a frontal lobe activity, and the more you activate your frontal lobe, the more you'll decrease activity in the limbic areas that generate anger and hurt.

When dealing with difficult people in your present life, you may find it helpful to set aside a few minutes every day to practice this meditation in conjunction with the forgiveness meditation that you will shortly learn. If you choose to meditate on the roots of your anger, simply watching where your thoughts and feelings go, in a few days or a week, you should notice a distinct difference in how you emotionally process your anger. In fact, you might find that underneath the anger are other strong feelings, like hurt. Use the same structure I just taught you, and substitute the new feeling for anger.

If you find yourself really stuck in anger, then I recommend that you do some form of aerobic exercise—you can even run around the block—until the anger subsides. It's almost impossible to stay angry when you're exercising, because any form of cardiovascular workout strongly activates frontal lobe circuits. Indeed, it may be the best and most reliable mood enhancer in the world.<sup>354</sup>

But meditation does something that exercise fails to do. It trains your mind to recognize the hundreds of subconscious thoughts that are associated with every mood. You start to *understand* how feelings work. By passively observing your emotions, you disengage from them, and this allows for a calmer mental state to take over. And as far as we can tell, only human beings have the power to use their frontal lobes to quash destructive feelings and thoughts. And that is one of the most important lessons that meditation has taught.

### **Exercise #11: The Imaginary Fight**

When dealing with anger, it helps to have an arsenal of peace-keeping weapons on your side, and research has found that having an imaginary fight will interrupt anger, and thus keep it out of your dialogue with others.<sup>355</sup> In fact, if you have an imaginary fight with some you are

angry at, you can discover what will, and will not work, at least when it comes to getting what you want. Try this exercise the next time you feel angry at your partner, your child, or a friend, but for now—assuming that you are not particularly angry with anyone—just recall an unresolved conflict from the past.

1. Visualize the person you were (or are currently) angry with. Scrunch up your face into a frown, and using your imagination, visualize the most unpleasant encounter you can: nasty expressions, a terrible fight, a screaming fit, or a cold, demeaning stare-down. Watch your visualization like a movie. Act it out in your imagination scene by scene. Imagine them insulting you, and respond by being as mean as you can. Let the spontaneous fight take over, and watch where it eventually leads. How does it end?

2. Next, think about the way you would normally confront this person. Say, in your mind, whatever comes to your mind. Yell at the person, or decide to talk in a firm tone.

3. Now imagine how that person responds. Ask yourself if that was the response you wanted to hear. If not, then repeat Step 2 by saying something different. How does your imaginary partner respond now? Keep repeating this step until you imagine how you can get the other person to respond the way you would like.

4. Finally, visualize the ideal encounter between you and the person toward which you feel conflict. What could you say to make the other person relax and be open to your view? Play it out in your imagination, and see how your imaginary partner responds. Ask yourself: “Is it possible to actually interact with this person in real life?” If the answer is no, repeat this step again.

Usually, this exercise will help you to quickly find a strategy that is more likely to succeed when you actually confront the person you are having a problem with. Most people, when they are angry, don’t take the time to do this, but if you turn it into a imaginative exercise, logic and reason will eventually win out. Thus, by using one’s imagination, you can resolve many conflicts before they actually occur.

A suggestion: whenever you confront a person about something that bothers you, begin with a genuine complement. Otherwise, the other person will probably be on the defense, and if so, your strategy may fail.

### **Exercise #12: Sending Kindness and Forgiveness to Others**

After you have interrupted your anger, I want you to do one more meditation before you engage with any person who has upset you. It is simple to do, but you’ll be surprised at the amount of resistance you may feel, even if you are not feeling angry. In fact, it may be the most difficult—yet most important—meditation in the world. Interestingly, it is also the cornerstone of every major religious tradition: the golden rule of loving your neighbors as you would love yourself.

But the Buddha and Jesus went one step further: they recommended that you practice forgiveness by loving your enemies as well. Gandhi, when counseling a Hindu whose child was killed during a religious war, suggested that the man adopt an orphan, but he was told to raise the child as a Muslim. I know few individuals who would have the fortitude to follow Gandhi’s

solution for alleviating religious hatred, but it does not dismiss the importance that forgiveness plays when it comes to getting along with others.

Forgiveness improves family relationships,<sup>356</sup> decreases depressive symptoms while enhancing empathy and life satisfaction,<sup>357</sup> and it can heal a wounded romantic heart.<sup>358</sup> Even the act of choosing to replace an unforgiving attitude with a forgiving one affects the peripheral and central nervous systems in ways that promote physical and psychological health.<sup>359</sup> In addition, most forms of religious involvement increase your capacity to be forgiving,<sup>360</sup> and so does meditation.

Take a moment to think about the person you hate the most, and imagine sending him or her love. It's not easy, is it? Most people would find it repugnant to think kindly about a psychopathic murderer, yet research has shown that victims of violent crime and war who can forgive their perpetrators have decreased anxiety and depression, while those who can't forgive are more inclined toward psychiatric disease.<sup>361</sup>

There are hundreds of books written on forgiveness, but one meditation exercise stands out as my favorite.

1. Begin by sitting quietly. First, send love to yourself by repeating the following prayer ten times, out loud, or silently to yourself:

May I be happy.

May I be well.

May I be filled with kindness and peace.

Notice how it makes you feel. If you feel uncomfortable, repeat this prayer by sending love to someone who you love—a friend, or even a pet: “May you be happy, may you be well, may you be filled with kindness and peace.” Keep repeating it until you are filled with a warm, compassionate attitude toward that person.

2. Now, turn that energy around and direct it to yourself: “May I be happy, may I be well, may I be filled with kindness and peace.” I cannot stress strongly enough the neurological necessity of generating self love, so if you still have difficulty with this step, make this meditation a priority in your life..

3. Next, turn your attention to the person you like the most. Smile as you visualize his or her face, and repeating the prayer above. Then return the love to yourself.

4. Then move on to another person, perhaps a family member or friend, and send that person your prayer. Notice how the feelings change when you think about this person.

5. Keep enlarging your circle by generating love to as many different people as you can: colleagues, neighbors, the mailman, etc. Again notice how the feelings change your mood.

6. Now extend your feelings to the people you find more difficult to love or forgive. Try saying the prayer and sending a loving thought to those you have hurt you in the past. If you feel resistance, don't fight it. Just acknowledge your feelings, and come back to loving yourself.

7. Pick one person who you find difficult to forgive. Look for one small quality that you like about them—perhaps his smile, or the way she styles her



hair—and focus your entire attention on that single trait. Try to recall one kind thing he or she once did, and concentrate on that. Hold the positive thought as long as you can, then notice if your feelings have changed. Do you feel less anger? Less hurt? Even the slightest decrease is beneficial to your brain.

8. Finally extend your love, kindness, and forgiveness to the world: “May everyone be happy, may everyone be well, and may everyone be filled with kindness and peace.” Hold a vision in your mind of all the different people in the world, all cultures, all colors, all religions, and all political groups. Imagine everyone getting along with each other and living together in peace.

It doesn’t take much effort to practice kindness and forgiveness, and if you make an internal commitment to do so a few minutes every day, you’ll train your brain to suppress anger and fear. You might even grow a few new neurons in your hippocampus, which we now know humans can do, but it’s important to remember that the hippocampus—which is essential for memory formation and emotional control—is the very first structure that is damaged by the neurochemicals of stress.

So the next time someone cuts you off on the freeway, or makes a clumsy mistake, instead of killing off some neurons in your own brain, just send that person a blessing. They probably need it as much as, or even more than, you.

Based upon research studies of different training programs developed at universities around the country, we recommend that you do a forgiveness meditation at least once a day for a minimum of six weeks.<sup>362</sup> When vice presidents and advisors at American Express were given a one-day forgiveness workshop, followed by four teleconference follow-ups over the following year, stress levels were reduced by 25%. They also generated an increase of 18% in gross sales, whereas those who didn’t participate in the forgiveness workshop only improved their sales by 10%.<sup>363</sup> Forgiveness meditation improves not only the health of your brain and heart, but your pocketbook as well.

### **Some Final Reflections on Meditation, Relaxation, and Consciousness**

Although we have only included twelve meditation-related exercises, if you did them all together, it could take you more than two hours to do. This, I am certain, would turn most people off. Even a daily practice of 40 minutes is more than many people are willing to do, even those this appears to be the “ideal” amount of time to receive all of the neurological benefits we have been discussing throughout the book.

But there is nothing ideal about “ideal.” Each person has a different capacity and willingness to engage in healthy activities, so it’s kind of like going to the gym. Some people love it, and some people hate it. Some people can only exercise for 10 minutes, and some like to spend hours working out. Doctors will tell you to spend 20 to 40 minutes doing aerobics, and many patients simply won’t try, even when their lives may depend on it.

The truth of the matter is this: each person should do what feels intuitively right. Otherwise, it becomes *work*. The same holds true for spiritual and mental practices. If it becomes a chore, you won’t do it at all. So if going to church once a month suits your nature, then enjoy it. After all, guilt will hurt your brain. And the same applies to meditation. Remember, our memory patients practiced for only 12 minutes a day, and they improved their cognitive skills. Other studies have shown that even a few minutes can be beneficial to you’re your health. So the amount you practice is really up to you. The more, the better, and the greater

variety, the better, but that's about all we can say. After all, happiness is the perhaps the ultimate ideal, but everyone will find happiness through different walks of life.

But from a neurological perspective, there is some advice to give. Exercise, social interaction, and optimism all tie for first place in terms of keeping your brain healthy, but meditation comes in second. But which ones? Benson's relaxation exercise, progressive muscle relaxation, and guided imagery all appear to offer equal health benefits and have been extensively researched, but the Centering Prayer, the Sikh meditation, and a wide variety of other meditations (yoga, mindfulness, transcendental meditation, mantra, etc.) all provide a wide range of neurological benefits. Unfortunately, studying meditation is little like comparing apples to oranges and fish. Each has specific health benefits, but they obviously aren't the same. And, considering that there are probably close to a 1,000 variations of meditation, if not more, it is next to impossible to definitively analyze all of the neural mechanisms involved.

So it all comes back to intention: what is it that you really want to achieve? If you want to sleep better, then try progressive muscle relaxation. If you want to feel more calm and alert, then use any of the techniques we've discussed. Yawning is probably the fastest, but it probably carries the greatest social stigma, since most people interpret it as a sign that you are tired or bored. And if you're angry, it should be clear which of the above exercises to use.

But, if you want to reach enlightenment, or feel a unity with God, then we have some specific advice to follow. You'll need to meditate daily, for at least 30 minutes, possibly more. And you'll need to become expert in one of the mindfulness techniques like the Centering prayer described above. At least this is what the research has shown so far. Of course, there's no guarantee that you'll have a unitary or mystical experience, a fact well recognized in the Buddhist meditation communities.

Advanced meditators can achieve deep states of unity and connectedness through intensive practice, and this can trigger some very unusual activity in the brain. If parietal activity declines, you alter your sense of self, and if you do this often enough, you may permanently alter the structure of your thalamus, which is part of the reality processing circuit in the brain. In these situations, the meditator may see the universe in an entirely different light.

When you consciously direct your intent on a particular object, the brain blocks out sensory and neural information that does not pertain to the object of contemplation, and it screens out anything it considers irrelevant. As your meditation progresses, this blocking becomes more intense. The end result is intense awareness of the object, and a loss of awareness of anything other than the object of meditation. If that object is God, then the meditator has the experience of becoming one with God, or the sense that God pervades all of reality. If the object of meditation disappears, as sometimes happens in the most intense mystical states, the person may experience the universe as a completely undifferentiated whole – a sense of absolute unity of all things. When this happens, you might become aware that “you” are not your thoughts, and this raises the paradoxical question of what “you” may actually be. This can happen in any of the exercises we described above, but it typically results after many hours of intense meditation.

Thus, focused awareness sometimes creates the uncanny sensation of losing your sense of self. As you begin to realize that “you” is a rather arbitrary neural construction, activity in the parietal area of the brain decreases, and your sense of self begins to dissolve. Most practitioners describe this state as being simultaneously enlightening and disturbing, because a core sense of self is one of the earliest neural constructs in the brain. However, simply shifting your focus back to your breathing turns out to be an effective way to handle such disturbances. Now you can understand why relaxation is such an important foundation, especially if your goal is to

modify an unwelcome personality trait. The only people who run into trouble are those with serious underlying personality disorders.

Ultimately, all that we are asking you to do is to become a little more aware of life. We want you to slow down, just a little, by paying attention to your body movements and your breathing as you go about your daily activities. And we want you to learn to become more aware of how your mind produces an endless stream of unconscious feelings and thoughts. By simply becoming more aware of what you think, feel, say, and do, you train your brain to become more organized and calm. Stress diminishes, and life begins to feel more pleasant and rich. It's easy to be mindful throughout the day, and all you need to do is to remind yourself to be aware. You can take a minute to "meditate" in the elevator, when you're standing in line at the grocery store, when you're stuck in rush hour traffic, or when you're gazing into the eyes of those you deeply love. This is what mindfulness is all about, and will change your brain in beneficial ways.

### **Destroying the Illusion of Universe**

Having a conscious intention or goal underlies nearly every form of meditation and prayer, but there is one style worth mentioning that has a very different objective. It is common in some forms of Eastern philosophies, but absent in most Western religious traditions. It involves the conscious pursuit of having no goal at all. You are attempting to achieve absolute inner silence. No emotions or thoughts—just pure awareness or consciousness of what is.

Many people have had spontaneous, momentary experiences of emptiness, but deliberately evoking such a state for more than a few seconds often takes years of practice. Those who accomplish it say that it is one of the most serenely ecstatic states they have experienced. To my knowledge, no scientist has yet to capture this neurological condition with brain-scan technology. However, one group of researchers may have come close. They found that an advanced group of Zen practitioners could reduce activity in parts of the brain that are usually stimulated by other forms of contemplative practice.<sup>364</sup> The result is a complete sense of unity, which is also described as absolute reality, a term that has been variously defined as pure consciousness, non-duality, the negation of physical reality, seeing the world or the mind as illusion, pure Godness, supreme spirit, or nothingness. Others have used the term to describe what is essentially unknowable, indefinable, unfathomable, immutable, unmanifest, timeless, spaceless, or formless.

I have previously identified this state in the brain as being related to a complete blocking of all information into your consciousness. Thus, the end result may be similar to the state reached through intense meditation on a single object, when the awareness of the object entirely disappears. At that point, the experience is often described as complete sense of oneness with the divine.

Clearly, this can be one of the most powerful types of experiences people can have, and it lies at the heart of many great philosophical and spiritual traditions. It is associated with a deep sense of realness, so real that our everyday reality seems like it is nothing more than an illusion.

Such experiences might be the ultimate goal of religious or spiritual practices, but the exercises presented here are not likely to get you to such a state. But they will help achieve a greater sense of relaxation, better cognitive skills using intention, and foster a greater engagement and awareness of yourself and the world in which you live.

## Appendix

### Meditation and Mindfulness: Books, CDs, and Resources

Today, “mindfulness” refers to the art and practice of bringing increased awareness to the daily activities in our lives. Originally, mindfulness-based meditations were derived from Eastern spiritual practices, but for the past 30 years, they have become secularly integrated into Western medicine and psychotherapy.

Creating a personalized meditation and relaxation program is easy to do, but since it is often difficult to “read” your way through a meditation, we recommend that you purchase a special CD I created that guides you through the key exercises described in this book. Go to [www.MarkRobertWaldman.com](http://www.MarkRobertWaldman.com). An intensive 58 day audio training program, called NeuroWisdom 101, is also available. It will train you in mindfulness *and* positivity, showing you how you can reduce stress or anxiety in just a couple of minutes. Visit [www.NeuroWisdom.com](http://www.NeuroWisdom.com)

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