section of the brain to take over the function of walking. This is exactly what we mean by *neuroplasticity*—assigning new functions to areas in the brain that had previously been used for something else.

If one action is repeatedly needed or requested, the brain is "taught" that the new function is important and that previously allocated brain areas need to be redirected for novel uses. Therefore, to circumvent the damaged area and allow Sam to walk again, Sam's brain had to convert areas dedicated to other movements to the task of walking. By reallocating its resources in this way, the brain prioritized the functions that are used or needed most often. For Sam, *reassigning* how certain brain areas functioned allowed him to walk again. That's truly an example of neuroplasticity in action.

In Connie's case, her hard work and effort "rewired her own brain in a rather curious way," according to Levine. What Levine expected to find and what actually happened were quite different. Since neuroplasticity typically overtakes functioning of *adjacent areas of brain tissue—on the same side as the original damage*—and assigns that adjacent tissue with a new function, Levine assumed that he would see activity in an adjoining part of Connie's *right* brain when he asked her to move the fingers of her left hand in the MRI scanner. Shockingly, this was not what happened. "What made it even more curious," Levine recalled, "was that the scan showed that the left hand had essentially 'borrowed' neuronal firepower from the area of the brain that usually controls the right hand." In essence, the left side of Connie's brain was controlling *both* her left and her right hands!

At first, this created problems for Connie because her brain was not sure which side she wanted to move. As Connie recalls, "For a long time, if I was exercising my left thumb, my right thumb would be going right along and I could not stop it. It was like the two parts were tied together." In Connie's brain, they actually were. Eventually Connie learned how to disconnect the two sides so that only one thumb moved when she wanted it to. These incredible examples of neuroplasticity—the left side of her brain taking over control of moving both of her hands and her ability to learn to separate out movement of one hand versus the other—proved to Connie that all her hard work of focusing her attention truly was rewiring her brain.

What made this feat so remarkable was that everything gleaned from Connie's brain scans and her symptoms indicated to most of her doctors that she would *never* recover *any* use of her left side. In their opinion, the part of her brain that controlled movement of her left side had been severely damaged and there was no way she would be able to walk or use her left hand again. After all, there seemed to be no location where "traditional" neuroplasticity could have

reassigned the task of moving her left hand. Although they knew neuroplasticity could work wonders, they just didn't see how it would be possible in Connie's case given the damage she sustained. What they did not count on was how determined Connie was, how sharply she could focus her attention on the task at hand, and how plastic or adaptable her brain could actually be.

NEUROPLASTICITY VERSUS SELF-DIRECTED NEUROPLASTICITY—IT'S IN THE FOCUS

On its own, neuroplasticity is neither good nor bad. It simply is a brain mechanism that developed to help us adapt to our environment and survive changing conditions. The real power is in the concept of Self-Directed Neuroplasticity, because it gives *you* a say in what happens to you and how your brain is wired.

SELF-DIRECTED NEUROPLASTICITY

> *Using the power of focused attention, along with the ability to apply commitment, hard work, and dedication, to direct your choices and actions, thereby rewiring your brain to work for you and with your true self.*

In the absence of goals and values (i.e., when it is not self-directed), neuroplasticity can be either a helper or a hindrance, depending on how you are unconsciously choosing to act and focus your attention. As you've seen before, left entirely to its own devices, the brain can direct you to act in less than optimal or beneficial ways. This is why actively focusing attention on developing new, healthy circuits is necessary to most effectively change a behavior that is impairing you. The good news is that problems caused by or made worse by maladaptive neuroplasticity can be markedly improved or solved by focusing your attention in a positive way.

In Connie's case, when deceptive brain messages led to unhealthy behaviors (e.g., not engaging in physical therapy), neuroplasticity definitely worked against her: She could not rewire her brain in ways that she wanted and her progress was halted. However, when Connie directed her attention toward her physical therapy goals and made the

effort to continue exercising her left side, Self-Directed Neuroplasticity was the agent of change that assisted in rewiring her brain.

The take-home point is that neuroplasticity is operating all the time, which means that if you repeatedly engage in the same behaviors (even something as benign as checking your e-mail several times a day), neuroplasticity will designate that action as the preferred one, regardless of the effect of that behavior on you and your life. In a very real way, the actions you perform now and how you focus your attention have downstream effects on how your brain is wired and how you will automatically respond to deceptive brain messages and events in the future. Thus, for better or for worse, focused attention creates the brain you will live with, which is why we constantly stress that *the power is in the focus.*

Finding Meaning in the Face of Adversity

Connie's ability to focus her attention constructively and reject her deceptive brain messages, sensations, and habitual responses was key to her recovery. As she and Levine both acknowledged, she was able to keep putting forth sustained effort in the face of significant adversity because she designed many of her goals around things that truly mattered to her.

For Connie, finding meaning and believing in her true self are what fueled her to keep going forward. For instance, Connie's first goal in therapy "was to tie a snake in a pillowcase. Of course, they laughed," she remembers, but it was a meaningful goal to her. She has a gift with snakes and greatly enjoys working with them. As she explains, "I put snakes to sleep!" and that talent meant the zoo staff always turned to her when they had a snake that was trying to bite or wiggle away. The trick with snakes, she says, is that you need two hands to properly handle and transport them. So, Connie's physical therapists put tennis shoes in a pillowcase and had her work on learning how to tie it with her right hand at the same time as she used her left hand to keep the snake in the bag and ensure it did not get caught up in the knot. Because of her continued effort and focus of attention, Connie was able to master this skill and within weeks was back at the zoo working with the animals.

As incredible as that progress was, at the end of those initial seven weeks she still could not use her left arm or grip with her left hand very well. Prior to the stroke, Connie enjoyed a full-time career as an outreach coordinator at the zoo, spent time cooking with family and friends, swam several days a week, and had many hobbies. Losing the use of her left arm severely curtailed Connie's ability to continue most of these activities, including her position at the zoo. But Connie did not let this dampen her spirits or pull her down.

In fact, finding ways to be of value and designing physical therapy goals around things that truly mattered to her inspired Connie and gave her the motivation to keep going forward, even when she had to face her very real limitations and changes in her roles. Rather than becoming demoralized or defeated, Connie found ways to make life meaningful by taking advantage of the opportunities available to her and by fulfilling new roles, such as fielding calls from the public about animals and teaching animal handling classes to the volunteers. "It's not what I wanted to do," she remembers, "but it was helping someone" and it signaled to her that she still "had something to contribute."

Psychiatrist Viktor E. Frankl knew a lot about finding meaning in one's life, especially when facing incredible adversity. Living through confinement in concentration camps during World War II, Frankl realized that those who survived the camps were the ones who found meaning in their lives and made the most of the opportunities presently in front of them. In his insightful and moving book *Man's Search for Meaning,* Frankl quotes Nietzsche: "He who has a *why* to live for can bear with almost any *how*."[3] That *why* could include anything, but Frankl specifically felt that having a purpose, role, or making an impact were key goals that provided people with meaning when they were facing difficult situations. He saw this play out with many of the prisoners and specifically remarked that any person who "saw no more sense in his life, no aim, no purpose, and therefore no point in carrying on . . . was soon lost."[4] Having meaningful goals and looking forward to future events, Frankl believed, is crucial in maintaining your hope and resolve when times are tough.

In addition to defining meaningful goals, determining how you will view a situation can have a profound impact on your motivation. Frankl noted this when he said, "Everything can be taken from a man but one thing: the last of human freedoms—to choose one's attitude in any given set of circumstances, to choose one's own way."[5] When faced with uncertainty or significant difficulty, including the relentless onslaught of deceptive brain messages and uncomfortable sensations, realizing that you have a choice in how you respond to the situation is critical.

While the specifics of a circumstance may be out of your control, your response is firmly within your domain—something Connie knew and embodied. This includes how you see yourself and whether you believe you are worthy of overcoming your deceptive brain messages and changing your behaviors. One way to keep going toward your goals, even when you are being bombarded by false brain messages, is to infuse meaning into your life wherever you can. As Frankl noted and Connie's story proves, having future goals is one of the best ways to achieve this.

Defining Her Goals

Connie's ability to find meaning in her life and design goals that mattered to her is exactly what Frankl was talking about. Rather than giving up, Connie designed goals that held meaning for her and viewed each difficulty as a challenge that could be overcome rather than a roadblock.

Whether it was relearning activities she enjoyed doing before the stroke, such as sewing, playing her guitar, and swimming, or prioritizing things like being independent, living life to its fullest, spending time with family and friends, and being actively involved in her church as a commissioner to the national assembly, all of her goals were related to what mattered to her. Interestingly, what is clearly absent from her list is anything pertaining to social status or financial wealth—two things that Frankl did not identify as providing truly sustaining meaning in one's life.

If we were to place Connie's goals and values into categories, they would look something like this:

Goals			Values
ACCOMPLISHMENTS	RELATIONSHIPS	LEISURE	INTRINSIC QUALITIES
Teaching	Spending time with family members	Swimming	Being independent
Calming the animals and handling them safely	Thanksgiving dinner at my house	Playing guitar	Being loving and caring
Making crate covers for the animals' cages	Church community	Sewing	Having faith
Church commissioner	Monthly dinner with friends	Cooking	Being a good person, being ethical

GOALS

• **Accomplishments:** work/career, awards/accolades, giving to others, skills, knowledge, and legacy materials (things that will remain when you are gone, such as educational materials, videos, art, and so on).
• **Relationships:** family (including children, parents, partners, siblings), friends, pets—any connection that has an emotional component and involves caring about another being.
• **Leisure time/recreation/fun/self-care:** travel, hobbies, learning for the joy of it, sports, eating better, going to the gym, and other interests that engage/inspire you.

VALUES

• **Internal/intrinsic qualities:** personal characteristics that you are proud of, such as being loving, caring, giving, courageous, honest, smart, hardworking, industrious, a good provider, and more.

Now that you understand how important meaning is when setting goals, start defining your true goals and values in the categories listed below. As Frankl notes, prior achievements are important and give our lives meaning, but when facing uncertainty and adversity—such as beginning to tackle deceptive brain messages—looking toward the future is what provides meaning and motivation to persevere when times get tough. Therefore, in this table, focus on *future goals*, not past ones that you have already accomplished.

DEFINING YOUR MEANINGFUL GOALS HOW DO YOU WANT TO ACT?

Accomplishments:
Relationships:
Leisure/Self-Care:

DEFINING YOUR VALUES—WHO DO YOU WANT TO BE?

Intrinsic Qualities:

When times are difficult, you need to use meaningful goals as a foundation to help you persevere through adversity. At the same time, you must muster up the effort to keep going forward, even when your deceptive brain messages are at their worst. How can you generate and maintain a sufficient level of effort to achieve your goals? Let’s review some interesting scientific findings that attempt to address this question.

Where Desire Was, Effort and Expectations Will Be

Why is it that some people seem to be able to change a habit quickly or bounce back from difficulties, whereas others remain depressed, anxious, or addicted? Part of the answer clearly lies in how deeply entrenched deceptive brain messages are and how strongly the patterns are wired into the brain. Once you know that your brain wiring is a large part of the problem and that you can do something about it, what causes some people to put forth the effort to make changes while others do not?

While no one knows all the answers, David D. Burns, M.D., a psychiatrist and author of the bestseller *Feeling Good*, has an idea about what separates out those who succeed. He has been studying who will improve from a depressed state by analyzing variables that scientists and therapists have assumed were key, such as motivation, character traits, and length of depressive episode. From his work, he found that *putting forth the effort* to learn specific ways to soothe oneself (known as emotion regulation skills) and examining thought patterns (i.e., identifying and Reframing deceptive brain messages) are among the best predictors of who will improve when they are feeling depressed. In essence, *the people who are willing to put forth the effort required of them to heal tend to do better.*

This is not that surprising a finding, but here's where it gets interesting. While effort was positively correlated with good responses (i.e., the more effort, the more improvement), *desire* to feel better was actually negatively correlated with positive outcomes. In other words, strong desire to feel better without the corresponding effort actually made things worse.

DESIRE

> The experience of wanting to *avoid* something unpleasant or wanting to *achieve* a pleasant result.

At first, this finding may not make much sense. Most people assume that desire is a strong motivating factor in getting you closer to your goals. While that intuitively makes sense at some level, Donald D. Price, Ph.D., a distinguished placebo researcher at the University of Florida, knows this is not

the case. He has been studying the placebo response for more than twenty years and has seen firsthand how desire can actually make a person feel worse.

Through his research, Price discovered that *expectation* of a positive result—for example, expecting pain relief when an inert cream is applied—is *more important than desire* in determining how much pain relief you experience. In his studies, if a person expected a placebo cream to work, his pain was much less than when he did not expect the cream to work. Even more intriguing, when people were told they were going to receive a drug known to cause pain relief in *most* people (it was really saline) before undergoing a painful experimental procedure, they reported that their pain relief was of a similar magnitude to what one would have with a therapeutic dose of novocaine. In related non-placebo studies, Price found the same thing: If a person had low expectations, coupled with a high desire to avoid an unpleasant outcome, he actually felt worse. The key finding from Price's work is that *desire—in many cases—works against you.*

From the findings of Dr. Burns and Dr. Price, it seems clear that what you think motivates and sustains your effort may not be what actually gets you closer to your goals. Expectations, it appears, are far more important than desire in achieving results. If you, like most of the world, made the assumption that desire was key, these beliefs may be part of the reason you have not made more progress in countering deceptive brain messages in the past.

Remember what Connie described when she got so frustrated and angry—feeling overwhelmed and having a *strong desire to rid herself of the uncomfortable sensations* that were caused by her deceptive brain messages? When she could not achieve what she wanted (e.g., completing a specific therapy exercise), Connie's deceptive brain message swooped in and told her she *should* be able to do it—thereby implying that something was wrong with her. This caused the uncomfortable sensations of anger and frustration to rise in Connie—negative sensations she wanted to be free from immediately. Her desire for relief was high and her expectation of achieving her goal, which had switched from completing the therapy exercise to feeling better immediately, was low. As long as she maintained the unrealistic expectation to get rid of those uncomfortable sensations and feel better, she was stuck and would feel worse—exactly what Price found in his research studies.

Instead, when she called the sensations what they were—anger and frustration—she was able to switch gears and focus her attention on a realistic expectation, such as completing the therapy exercise one more time for the day or switching to another exercise that was similar but easier for her to complete. It was only when she applied considerable effort to focus her attention on things that mattered to her (by creating a reasonable and achievable expectation based on

her meaningful goals) that she was able to move forward and change her brain.

From our perspective, deceptive brain messages are harmful because they create unrealistic expectations coupled with strong desires that cause you to act in unhealthy ways to achieve momentary relief. By trying to achieve momentary pleasure or rid yourself of an uncomfortable sensation, you engage in actions that are not consistent with your long-term goals and values. This causes you to feel worse about yourself and the situation in the end.

What is desire and why is it not the best motivator when you are dealing with deceptive brain messages? Desire truly is a form of craving for an outcome, an event, or a specific feeling. As you will learn in chapter 4, craving originates in the brain's Drive and Reward centers—two regions that are focused on self-preservation and instant gratification. Why is this problematic? Remember that the brain is constantly receiving inputs and is heavily influenced by the environment, which means desire and craving are based on the *momentary, fluctuating* signals generated by your brain. In this way, desire emanates from basic brain drives that are designed to satisfy short-term goals, not the long-term goals related to your true self.

Responding to desire indiscriminately (i.e., without awareness) is like building a house of cards. Eventually, the whole thing is going to come crashing down because desire is not based on anything constant or stable. Rather, desire and craving ebb and flow based on what is happening in the world and in your brain. Desire can easily be derailed by competing priorities, lack of rapid results, or boredom. More to the point, any specific desire that is present right now can be overshadowed by another desire that is stronger or that pops up a few moments later.[6] That is why we want you to learn how to become aware of strong desire and craving as it arises and Relabel it with Step 1.

As Connie's story shows, putting forth the effort and setting realistic expectations based on meaningful goals are critical to succeeding. How do you strengthen your resolve to put forth the effort? The first step is *seeing that there is a problem* and that basing your level of effort on desire or craving is a losing proposition.

With these research findings in mind, think about the ways in which desire can fail you. Desire affects all aspects of our lives, from our eating habits to relationships to work. Some ways desire can wreak havoc in your life include the following:

- Causes you to want things you cannot have (leaving you feeling sad or depressed)
- Causes you to do things that are ultimately harmful to you

• Creates unrealistic expectations that do not come true
• Prioritizes based on brain-based craving, not on what is best for you in the long run (which can cause you to lose time or not complete important tasks)
• Fails to maintain the same level of effort when times get tough or the situation seems impossible (e.g., whatever you wanted to happen isn't occurring fast enough, so you give up—a good example of this is weight loss, changing your eating habits, or exercising more)
• Competes with and overtakes other cravings (such that new cravings arise that overshadow/replace the former desire)

EXERCISE: How has desire failed you? Take a moment to write down ways that being ruled by strong desire and craving has actually worked against you.

Why is it important to list the ways in which desire can hurt you? If you cannot see how detrimental desire is, you will not be able to reprioritize your life based on meaningful goals that help you put forth the effort needed to succeed.

Defining Your Meaningful Goals

Any goal-setting agenda begins with evaluating the current state of affairs. In the case of deceptive brain messages, you need to look at the costs to you of continuing on your current path. Let's start by considering how much your behaviors and thought patterns are interfering with your life and impeding you from reaching your goals. Answering the questions below, use the goals you generated earlier in the chapter and add new ones that may have come to mind.

WHAT ARE YOU DOING THAT YOU WANT TO STOP?

(e.g., eating carbs when I am stressed out; using alcohol to calm myself after I get into an argument with someone; calling my ex-boyfriend whenever I feel lonely)

WHAT ARE YOU *NOT* DOING THAT YOU WOULD LIKE TO DO?

(e.g., eating healthfully; exercising more often; spending time with friends; meditating in order to notice my thoughts and soothe myself)

Now that you understand how important *effort* is in achieving your goals and that competing priorities and desires can derail those efforts, rate how meaningful each of your goals is to you on a scale of 1 to 10, where 1 = not important at all, 5 = moderately important, and 10 = extremely important (a priority in my life). Also rate how much effort you are willing to put forth or which other opportunities you are willing to forgo to achieve each of your goals using a similar scale of 1 to 10, where 1 = will not expend any effort, 5 = would be willing to work hard/give up other things 50 percent of the time, and 10 = will work hard/prioritize this over everything else 100 percent of the time. We have provided a sample chart to help you get started. (Note: Use the categories only if they are helpful to you; otherwise simply list all of your goals on page 54—but make sure you do not include desires or cravings.) We have left intrinsic qualities, such as being honest, caring, or hardworking, out of this table because they represent values that tend to not include tangible goals. They certainly provide your life with meaning, but for the purposes of this exercise we want you to focus on accomplishments, relationships, and leisure/ self-care.

DEFINING MEANINGFUL GOALS

Category	Goal	How Important Is This Goal? How Much Meaning Does It Provide?	How Much Effort Will You Put into Achieving This Goal?
Accomplishments	Get that promotion at work	10	10
Accomplishments	Stop eating carbs when I am stressed out	8	7
Accomplishments	Meditate thirty minutes a day	9	10
Relationships	Spend more time with my family	10	6 (other competing priorities like work)
Relationships	Go out socially with my friends at least twice a month	7	5
Leisure/Self-Care	Go to the gym four days a week	9	7
Leisure/Self-Care	Travel within next six months	6	3
Leisure/Self-Care	Eat healthier—more greens, protein, and fiber	8	4

DEFINING MEANINGFUL GOALS

Category	Goal	How Important Is This Goal? How Much Meaning Does It Provide?	How Much Effort Will You Put into Achieving This Goal?

Category	Goal	How Important Is This Goal? How Much Meaning Does It Provide?	How Much Effort Will You Put into Achieving This Goal?

Now that you have examined what you want to change and what provides you with meaning, determine what your true priorities are at this point in your life. Using the information in the table above, prioritize each of your goals based on how important it is to you *and* the effort you will expend to achieve it—do not rank them based on your desire.

If you honestly ranked how willing you were to achieve each goal, the priority list should begin with the things you ranked highest on the Effort scale. In our example, there was a tie in terms of Effort level—both "promotion at work" and "meditation" received scores of 10. Since "promotion" also received a score of 10 on Importance, it would be ranked #1 and "meditation" would receive the #2 spot. Look at the example we provided below to get a sense of how to rank your goals.

Meaningful Goal	Effort	Importance
1. Focus on promotion at work	10	10
2. Meditate for thirty minutes every day	10	9
3. Go to the gym four days a week	7	9
4. Stop eating carbs whenever I am stressed out	7	8
5. Spend more time with my family	6	10
6. Go out socially with my friends twice a month	5	7
7. Eat healthier	4	8
8. Travel within the next six months	3	6

List your priorities here:

Meaningful Goal	Effort	Importance
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

In the example above, the person ranked “stop eating carbs whenever I am stressed out” as #4 on his list. Obviously, if one of the person’s problems is eating carbs whenever a deceptive brain message strikes, he may need to reevaluate how unhelpful that behavior truly is and figure out ways to make that goal more meaningful so that it ends up higher on the list.

How can you change your priorities? There are no easy answers, but our patients have mentioned one powerful motivator they’ve used: knowledge of the brain and what it is trying to do each time a deceptive brain message strikes. As they explain it, knowing that you are not the cause of the messages or urges, but that you can do something to make your brain work in helpful ways based on your goals and values, helps a lot. In chapter 4, we will introduce you to this powerful brain biology, which has inspired many people to increase their effort levels when dealing with deceptive brain messages. For now, the important point to realize is that the desire to feel better and the willingness to put forth the effort do not go hand in hand.

Even when you are ready to put forth the effort, finding ways to integrate these activities into your day can be daunting. In fact, not having enough time is one of the biggest challenges people face when beginning any kind of change. How do you work around this problem? Let’s return to Connie’s story and see

how she fit her therapy into her daily life.

Finding the Time

Without the structure of her physical therapist telling her what to do and when, Connie had to be creative in finding ways to integrate her therapy into her day. “I’m not a person that can set aside a half hour a day to do certain exercises,” she says. “That’s just not my makeup.” While the physical therapists recommended traditional exercises, Connie knew she would not do them. “Their thing was: Here’s a Thera-Band. Go do so many pulls this way and that way. Regular therapy. I just don’t have time for that.”

Instead, Connie made progress because she was willing to continue working hard to achieve the goals that mattered to her. One of these areas was related to her fine motor skills, which have never completely come back to their original level. Grip strength is the most difficult for her and it’s why she does not work with many of the animals she used to enjoy, including the larger birds. To continue strengthening her left hand, Connie would deliberately choose to use the hand even when it was not necessary. In the kitchen, she would hold a tomato rather than place it on specialty prongs on her cutting board. Similarly, if she was transporting items from the kitchen to the living room, she would “figure out ways to use the left hand to help support” whatever she was doing so she could make fewer trips. Her goal was to use her left side as much as possible while also devising ways to make her activities more efficient and easier. “I am good at coming up with alternate ways to do things, I always have been,” she says. “If there was an easier way to do something, I’d find it. I enjoy that kind of challenge. Thinking things through . . . How can I use my hand to make this job simpler?” Similarly, Connie would exercise the fingers of her left hand while driving and would walk whenever possible.

A key to her success was that she made exercising the left side of her body a priority and used every opportunity that presented itself to her. However, this was not obvious or easy to do at first. In fact, for quite a while, Connie had to remind herself to use the left side of her body because the thought did not spontaneously occur to her. Like most people, this was not something she had to think about before the stroke, and her Habit Center had not yet been retrained to automatically use her left side.

What does that mean for you? Connie's struggle to find the time to integrate her treatment into her daily activities is *exactly* what you need to learn how to do—with your mind. The most encouraging fact about mindfulness and the Four Steps is that they can be practiced anywhere and at any time. So, just like Connie found opportunities to use her left hand when she didn't absolutely need to, you need to find times in your day to use your mind (i.e., by practicing the Four Steps) even when it might not be absolutely required for whatever you are doing. In short, you need to be on the lookout for deceptive brain messages all day long and use the Four Steps whenever deceptive brain messages arise. We will teach you how to do this in Part Two.

What's next for Connie? Continuing to find novel ways to use her left hand so that it strengthens even further. Currently, the zoo has two unruly inhabitants that sorely need her help and that require her to use both hands to work with them. As she explains: "I take the tough animals. We have two bearded dragons that are hell on wheels. I've been working with them—they are an accident waiting to happen. They just want to get away." As Connie works with them, her brain will continue to rewire and she will be that much closer to achieving her goals.

In the next chapter, we will explore the reasons why habits are so hard to break and learn about Free Won't and Veto Power—two powerful concepts that allow you to say no to deceptive brain messages and yes to your true self.

CHAPTER 3

Why Habits Are So Hard to Break

Have you ever found yourself doing something you didn't really want to be doing and wondered why you're still doing it? For Steve, a fifty-five-year-old executive in a high-powered job, this was a daily, if not hourly, question. As one of the most revered men in the office for his intellect and ability to resolve problems, Steve had people constantly coming to him for advice. He loved the attention and thanks, but it also stressed him out. Over the years, he began to believe he was the only person in the office who knew what he was doing and that no one was taking the initiative or responsibility to deal with their problems on their own. It was frustrating and he was sick of it.

When Steve would get home, he faced more of the same. His wife and two children were always asking his opinion and wanted to include him in their activities. He never had any time to himself—no matter where he was, he felt barraged by other people's needs, which led to anger and resentment. Wanting to escape all the responsibilities and pressures of the day, he would come home, have a glass of wine, and head to the den to watch TV. Once the wine began to take effect, those upsetting emotional and physical sensations would dissolve and Steve would feel better. Given how well it worked, one drink at night eventually became two, and so on.

Although drinking wine helped Steve relax, it cost him dearly in his relationships with his wife and children. They complained that he never talked to them, that he was distant and unapproachable. Steve felt conflicted about what he was doing. He loved his family and wanted to connect with them, but he just couldn't tolerate their needs after a long day at work. If only they could be more independent, then maybe he wouldn't have to drink so much.

He got to the point where he was drinking a bottle of wine every night and was having cravings to drink alcohol during the day. Whenever he had a stressful interaction, the urge to drink was strong. At work, this created huge problems for Steve. He couldn't throw back a shot in the office, but he could have a glass of

wine at lunch. Drinking this much for several months reinforced the behaviors in his brain. He wound up having cravings for alcohol all the time and found that he would drink *even when he wasn't stressed out*.

What had started as a stress reliever had taken over his life. The urges to drink were present all the time and he could not stop thinking about the next time he could have one.

How Habits Form

What happened to Steve is essentially what happens in your brain whenever deceptive brain messages strike: Focusing on the deceptive brain messages and trying to make the uncomfortable, distressing sensations go away lead to automatic, unhelpful habitual responses. How does this happen? Whenever you repeatedly respond the same way to a deceptive brain message—by focusing on and engaging in an unhealthy behavior, such as drinking alcohol to calm your nerves—you essentially "teach" the brain to always respond in the same way (i.e., with the same unhealthy behavior) whenever a similar situation, thought, or impulse arises. So, every time Steve felt stressed, took a drink, and felt relief, his brain linked these events together. After Steve had done this enough times, the response became hardwired into his brain and he would start drinking largely without any awareness of what he was doing. In essence, the repetitive behaviors became automatic and unconscious—Steve's mind was no longer involved in determining how he would respond to stress.

In addition to teaching his brain to automatically and habitually respond the same way to a deceptive brain message, the attention he focused on these behaviors caused something else to happen: *It strengthened the brain circuits associated with drinking wine, which meant that Steve's cravings for wine increased.* This is why he began to crave a glass of wine even when he was not stressed or under the grip of a deceptive brain message.

In fact, whenever you repeatedly engage in *any* behavior (not just those related to deceptive brain messages), the brain circuits supporting it strengthen and the behavior becomes a preferred routine. If it is a helpful activity, that's fine and being aware of what you are doing is not all that important. However, when you engage in a behavior as a result of your deceptive brain messages and feel temporary relief (or in this case, an urge that results in momentary pleasure), you

are actually working against yourself. We cannot emphasize this point enough: *You are making things worse, not better*. So, not only do these actions waste your time, responding to a false brain message in this way actually amplifies the intensity of the uncomfortable sensations. We call this *feeding the monster*. We've coined this phrase to highlight how critically important it is to be aware of this process and how it can try to take over your life.

What, on a biological level, feeds the monster? *Hebb's law*, *the quantum Zeno effect*, and *attention density*. Let's review each of them now and apply them to Steve's situation.

HEBB'S LAW

Why is it that Steve's urges to drink got stronger the more he repeated the behaviors? The answer lies in Hebb's law, which states that when nerve cells are activated in the same pattern repeatedly, they eventually form a brain circuit. Once the circuit is established, the brain areas involved in the circuit automatically respond in the same way every time a similar situation arises. This causes the circuit to become stronger—and it is how habits, such as riding a bike, learning to drink when stressed, or relearning how to walk after a stroke, are created and maintained.

HEBB'S LAW

> Neurons that "fire together wire together." This means that when groups of nerve cells (or brain regions) are repeatedly activated at the same time, they form a circuit and are essentially "locked in" together.

You can think of Hebb's law as being similar to forming a new and more scenic hiking trail. Suppose a hiker is dissatisfied with the views on the original path. He wants to get closer to the scenic points and sees that several little patches have been cleared already since they are the most frequently used sites. All he needs to do is align all the little patches together so that a cohesive trail is formed. The first few times he walks around the new path, it is difficult to see where to go. The path is overgrown and difficult to traverse. In some ways, it would be easier to just go back to the original path, but it is much less direct and includes many views that are not nearly as breathtaking. So, he perseveres and

continues using the new path until one day it becomes well worn. Because it is easy to follow, other hikers start taking the path as well and soon the original path grows over from disuse. A new trail is formed and becomes the preferred route. We have demonstrated this process in figure 3.1.

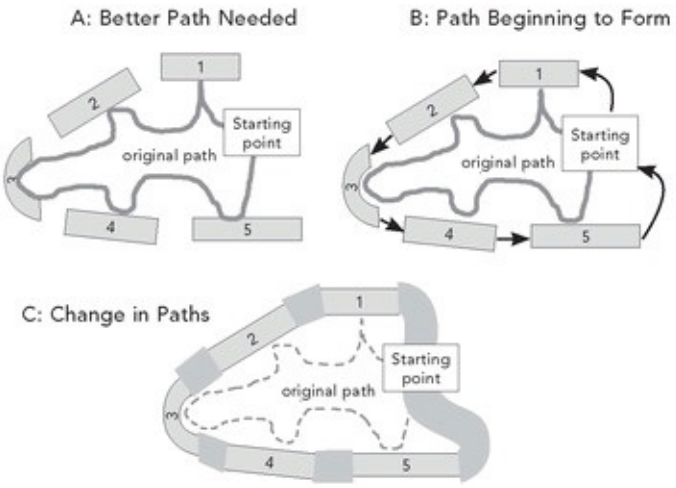

Figure 3.1. **A** represents the original path and the fledgling little patches, **B** represents the new path beginning to form, and **C** represents the new path becoming preferred while the original path withers. Note: Hebb's law is represented by the *linkages* or connections formed between the little patches, not the entire circuit (or path).

A very similar process happens in the brain. Using our hiking trail analogy, you can think of the little sections of the trail as the nerve cells or brain regions that have not been linked up yet. The more often these areas are recruited simultaneously ("fire together"), the more likely they will "wire together" and form a circuit. This is the essence of Hebb's law: *joining* brain areas together so that they work as one unit or circuit.

In Steve's case, when he combined wine with relaxation and social interactions, but did not engage in the behavior often, the circuits in his brain were weak and he did not crave wine on a regular basis. However, once he linked *wine and relief* together and repeated the behavior every night, the brain circuits began to strengthen. The more he engaged in the behavior, the stronger and more solidified that circuit became. As this happened, the Reward Center in his brain ramped up its activity and his cravings for alcohol became more intense.

How did Steve's brain learn to associate deceptive brain messages and urges

with drinking? By focusing his attention repeatedly on the stress and urges to drink, Steve taught his brain that the preferred response to stress was drinking alcohol whenever he was at wit's end. This repeated focus of attention gave the quantum Zeno effect the power it needed to help stabilize brain areas so that they could wire together via Hebb's law. In doing so, the brain developed this automatic and unhealthy response to stress.

QUANTUM ZENO EFFECT

Hebb's law works only when the brain areas involved activate—and *stay activated*—at the same time. If this did not happen, the brain regions would not be able to "wire" together. What keeps the brain areas activated long enough for Hebb's law to work? The quantum Zeno effect. As originally explained by Dr. Henry Stapp of UC Berkeley's Lawrence Berkeley National Laboratory working together with coauthor Dr. Jeffrey M. Schwartz, the essence of the quantum Zeno effect is that it *stabilizes* activated brain areas and holds them in place long enough so that Hebb's law can take effect. How does it accomplish this? Via *focused attention*. This is why one of our favorite mottos is "The power is in the focus!" The cornerstone of our Four Step program is learning how to *focus your attention away* from deceptive brain messages and uncomfortable sensations and *toward* things in your life that are important to you. This is *how* the mind changes the brain and why learning how to recruit your mind to focus your attention is so critical.

In the brain, you can think of the quantum Zeno effect as being the glue that holds the brain areas in place in an activated state long enough so that Hebb's law can help form the connections needed to create new brain circuits. The main thing to remember at this point is that *attention* is the key ingredient.

QUANTUM ZENO EFFECT

> Focused attention holds together and stabilizes brain circuits so that they can wire together by Hebb's law. Once they are wired together, the brain will respond to similar situations in a reliable "hardwired" way.

CREATING ENDURING BRAIN CIRCUITS WITH ATTENTION DENSITY

When acting in concert, Hebb's law, the quantum Zeno effect, and neuroplasticity explain why focusing your attention on something repeatedly causes brain circuits to form and strengthen. These brain principles explain how learning to ride a bike becomes automatic and why habits are so hard to break once they are formed. In the case of deceptive brain messages, following their false commands results in your strengthening the underlying brain circuits associated with those behaviors—circuits that cause you to act automatically and without awareness in ways that are harmful to you.

In Steve's case, focusing his attention on alcohol as a stress reliever caused his deceptive brain messages to drive responses in his brain that set up a strong, enduring brain circuit. This circuit got stronger each time he let his attention be grabbed by a destructive urge or thought. He fed the monster again and again. Eventually, with enough repeated acts of drinking to deal with stress, Steve's brain made alcohol the answer to many problems and wound up creating a huge new one in the process.

Attention Density

What gives deceptive brain messages, urges, and habits their strength? Repeatedly allowing your attention to be focused on them in a *passive* way (i.e., allowing deceptive brain messages to *control* your attention).

ATTENTION DENSITY

> *Repeatedly* focusing your attention on something (a thought, sensation, event, response, action) over and over. The more you sustain your focus of attention on something (i.e., the denser your attention is), the more likely a specific habit will be wired into your brain.
>
> In the brain, attention density is the first—and most important—step in creating strong, enduring brain circuits. Attention density makes the

quantum Zeno effect “kick in” and causes focused attention to have powerful effects on the brain by activating Hebb’s law.

Attention density is the key to stabilizing and strengthening brain circuits because attention is what drives the quantum Zeno effect. The main point is that the more you focus your attention on something, the “denser” your attention is. In Steve’s case, this means that whenever he allowed his attention to be grabbed *repeatedly* by the urge to drink, his attention density increased and the corresponding brain circuits strengthened. Remember: The power is in the focus! When focus is passively applied in an unconstructive way, unhealthy habits get wired into the brain.

Why stress the concept of attention density? After the initial destructive brain message hits, you (via your mind) have the ability to determine whether you want to pay attention to it or to something else. This means that attention density can work for you or against you. When you let your attention *passively* be grabbed by deceptive brain messages, you will be stuck repeating the same unhealthy patterns and actions. However, if you *actively* choose where to focus your attention and repeatedly apply it to a wholesome, constructive activity, you will rewire your brain in healthy ways that are consistent with your true self. In this way, attention density is crucial for Self-Directed Neuroplasticity—that’s why we have been spending so much time talking about turning your attention away from the deceptive brain messages and toward things that are helpful and meaningful to you.

Free Won’t: Don’t Believe Everything You Think (or Feel)

When Steve realized that his brain was being rewired because of his actions, he felt horrible. He believed that somehow he should have been able to control his deceptive brain messages and stop them from arising. If only he could find a way to beat the desires into submission or will them away, then he would be better and not feel the urge to drink. Sarah, the woman who became depressed and withdrew from her family when she was at her lowest point, also had these thoughts. She wanted to control the deceptive brain messages telling her she was a loser so that her depressive sensations (fatigue, lack of motivation, the urge to