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Pain, stress and your brain

No brain, no pain.

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Pain hurts. It's a mixture of unpleasant physical and emotional feelings which take away your ability to participate in and enjoy life. Physically, pain takes away your ability to feel comfortable in your own body. Emotionally, pain takes away your ability to feel happy. Chronic physical or emotional pain leads to anxiety, depression, and even post-traumatic stress disorder. Because of how it affects us, there is no problem more urgent than pain. Chronic pain is also a very difficult problem to overcome. We may seek help from a doctor or therapist, but traditional treatments are often ineffective. Chronic pain doesn't even make sense in terms of our usual understanding of pain. Two areas of scientific inquiry have started unlocking the mystery of pain: one is stress research and the increase in knowledge about how stress affects the nervous system; the other is neuroscience and the expansion in knowledge about how the brain works. These discoveries have led to the development of new healing strategies based on changing the brain processes that maintain pain.

Although we are used to thinking of pain as a physical problem, and increasingly an emotional problem, it also helps to be able to think of pain as a brain problem. Why? Firstly, your brain is responsible for regulating all the symptoms of your body, including heart-rate, temperature, mood, sleep, etc. Secondly, your brain acts as a kind of experiential decoder of everything that happens to you. It tells you whether something is good or bad, friend or foe, edible or poisonous. Based on its

interpretation of events, your brain guides you on how to respond. But your brain does more than passively receive information; your brain is also altered by what you experience—what scientists call neuroplasticity. Examples of neuroplasticity include the discovery that the area of the brain responsible for memory and navigation is larger in London taxi drivers.¹ Adults who were abused as children have been found to have smaller hippocampi.²

The types of experience that most affect the brain are those that threaten your physical or mental health—accidents, injuries, family problems and so on. These sorts of events trigger a strong reaction in the brain and, over time, affect its structure and functioning. Prolonged severe stress impairs your brain's ability to regulate your body and cope with pain. For example, the more stress you experience, the more sensitive your brain becomes to pain. There's nothing strange about this—just think about how much better you cope with physical pain or stress when you feel relaxed compared with when you feel tired or depressed. Fortunately, neuroplasticity works both ways: what has been learned can be unlearned; what has been missed can be recovered. But first you have to understand how your brain works and the nature of the relationship between your body and your mind.

From your body to your brain

How does pain get into your brain? Pain begins in your body. Physical pain is a product of nerve signals stimulated by tissue damage, which travel from the body to the brain. Your brain responds by signaling the muscles to tighten and protect the injured part of your body. It also guides you to “rest and protect” the injured area. Over time the damaged tissue heals, the central nervous system ceases to send out signals, and the pain goes away. This kind of pain, which is how most of us think about pain, is known as acute pain. Acute pain is time-limited, consistent with the injury that caused it, and generally manageable. Pain that persists beyond normal healing time-frames—chronic pain—is different. Chronic pain usually starts with an injury or illness, but is greater than would be expected for the injury that caused it, and it doesn't respond to normally effective treatments. Chronic physical pain comes in many different forms, including:

- arthritis
- back pain
- cancer
- complex regional pain syndrome
- fibromyalgia
- sciatica
- somatization disorder
- migraine pain.

Chronic pain involves a different mix of physical and mental symptoms than acute pain. Some types of chronic pain are mainly physical in origin. For example, arthritis pain is mainly understood in terms of physical pathology—damage to the joints of the body. Other types of pain involve both physical and mental factors. Complex regional pain syndrome (or reflex sympathetic dystrophy) is caused by a disturbance of the sympathetic nervous system—the network of nerves located along the spinal cord which controls bodily functions such as the opening and closing of blood vessels and sweat glands. Fibromyalgia involves increased sensitivity to pain, including touch (known as allodynia) and fatigue in muscles and tendons. In addition to physical pathology, complex regional pain syndrome and fibromyalgia are thought to be maintained by a genetic predisposition to stress. Chronic pain is also processed differently in your brain, with greater involvement of areas of the brain involved in memory and emotion than for acute pain.

Migraine pain is thought to be caused by hypersensitivity in the brain. In *The Migraine Brain*, neurologist Carolyne Bernstein proposes that the brain cells of migraine sufferers are more easily aroused by stimuli such as fatigue, stress, temperature changes and certain foods. Bernstein bases her model on research wherein migraine sufferers were found to have brain abnormalities including thickening of the somatosensory cortex—the area of the brain that relays pain and sensation. Other research has found structural impairments in the brains of chronic pain sufferers which affect the brain’s ability to maintain itself in a balanced state while they are performing mentally demanding tasks. Bernstein concludes that one of the causes of migraines is that the brains of people who have migraines are different and function differently. The question is: what causes the brain to behave in this way, and what can you do about it?

Pain, stress and your brain

Stress is the feeling of tension we get when faced with an event that we feel unable to control or cope with. The term actually comes from the Latin word “stringer” which means to draw tight. In terms of normal, everyday stress, there are basically two types of stress—acute stress and chronic stress. Acute stress is triggered by short-term challenges, such as temporary unemployment, illness, or running to escape a mugger. Acute stress involves a temporary state of heightened arousal producing increased adrenalin, constriction of the arteries (to maximize blood pressure), metabolism of glucose and fat into energy, etc. These changes, which produce a surge in energy and alertness, are short-lived and dissipate once the stressor has passed. Acute stress is often referred to as the “fight-or-flight” response or the “rabbit in the headlights” look (or deer or fox depending on the types of wild animals where you live). With the exception of life-threatening events (see below), acute stress doesn’t normally have any long-term effects.

Chronic stress is triggered by more severe forms of adversity, such as being raised in an emotionally unstable family, significant rejection, abuse or criticism during childhood, chronic illness, having to live or work in unsafe conditions, etc. One of the most common and damaging types of chronic stress is physical abuse and/or emotional neglect in childhood. Emotional abuse means being subject to criticism or ridicule by our parents, being manipulated and/or being held responsible for things that are outside our control. Emotional neglect means not receiving adequate love and affection because mom and dad were either not around or because they were unable to show love. Emotional abuse and neglect tend to occur in families where there was mental illness, alcoholism or drug abuse, intergenerational abuse or neglect, violence and instability; however, they can also occur in apparently normal families where everything may appear happy on the surface but there is no real intimacy. In such cases, emotional neglect can be subtle; we may believe we were loved because our physical needs were taken care of, but maybe we were never (or rarely) touched, held or told we were loved.

Another type of stress comes from experiencing (or witnessing) life-threatening situations such as motor vehicle accidents, physical or sexual abuse during childhood, rape, assault, war combat, or even being diagnosed with a life-threatening illness. The event must also have involved feelings of intense fear, helplessness or horror, although sometimes these feelings may not have occurred until some time later. Post-traumatic stress disorder (PTSD) involves more severe symptoms than those of normal stress, including nightmares and flashbacks, avoidance, numbness, trembling and catatonia. PTSD can also involve re-experiencing symptoms, wherein the sufferer actually re-lives the traumatic event in their body. These re-living symptoms can incorporate physical pain, making PTSD the most potent form of stress in terms of causing pain. PTSD-like symptoms can also result from non-life-threatening stressors such as emotional abuse and neglect, workplace bullying, the unexpected death of a loved one, or being sued. Of course, these effects are increased when traumatic stress is combined with chronic stress.

Why all this talk about stress? Because after physical injury, it is the second leading cause of chronic pain. In one of the largest investigations of its kind, a study of 9508 adult members of a health plan in the USA found that people who had suffered severe stress were more than twice as likely to have health problems (e.g. heart disease, diabetes, fractures and occupational health problems) compared with people who had not.³ These researchers also found that the more stressful events a person has experienced, the greater their risk of pain and illness. Stressed people experience greater levels of pain than non-stressed people with similar injuries, and they don't respond as well to normally effective medical interventions.⁴ Stressed people are more likely to be injured at work and experience greater levels of disability than non-stressed people.⁵ Stressed people are more likely to have complications following surgery.⁶ Stressed people are even more at risk of the common cold!⁷

The predisposing effects of stress on pain are potentially felt from infancy; if your mother was stressed while you were in the womb, or your birth was marred by complications or post-natal problems, you may be more vulnerable to pain. Researchers have found that premature infants who were subject to painful medical procedures became more sensitive to pain than normal babies.⁸ The types of stress most likely to lead to pain include:

- early childhood adversity (e.g. physical or sexual abuse, witnessing domestic violence, having a parent with a mental illness, family instability, etc.^{9,10})
- emotional abuse and/or neglect^{11,12}
- traumatic stress (e.g. accidents, surgery, diagnosis of a life-threatening illness, abortion, combat trauma, exposure to political violence¹³⁻¹⁸).

Stress is involved in just about every type of chronic pain, including fibromyalgia, gastrointestinal problems, headaches, and chronic widespread pain. Conditions such as diabetes, heart disease, bladder problems, immune disorders, digestive and genitourinary disorders, irritable bowel syndrome, skin problems and increased risk of fractures have all been linked to PTSD.^{19,20} PTSD is also more common among sufferers of fibromyalgia, reflex sympathetic dystrophy, chronic fatigue syndrome, and temporomandibular disorders.^{21,22}

Severe stress is also more common than is generally thought; emotional stress such as anxiety and depression affects 20 per cent of people in many countries. Even traumatic stressors, which used to be considered unusual, have been found to occur in over 50 per cent of people, with problems such as child abuse and neglect affecting around 25 per cent of children in developed nations.²³ Chronic pain is also stressful; it robs us of the ability to feel comfortable in our own bodies, and it takes away our ability to live in the present and plan for the future. The stress from chronic pain can take various forms including negative feelings (anxiety, depression), memories (of past pain) and thoughts (“I can’t stand this anymore.”). The stress caused by chronic pain has long been thought to explain the additional suffering associated with this problem. The more stressed we feel, the less well we cope and the more we hurt.

Although some people still get hung up about the mention of psychological factors in relation to pain, the idea that stress is involved in pain is not new. The nineteenth century psychiatrist Pierre Janet described stress as “a disease which modifies the whole organism”.²⁴ Sigmund Freud was also famous for suggesting that physical pain could be a symptom of emotional hurt.²⁵ Over 40 years ago, the International Association for the Study of Pain actually re-defined pain as “. . . an unpleasant sensory *and emotional* experience associated with actual or potential tissue damage . . .” (italics mine). Accepting that stress is part of your pain doesn’t mean that you’re crazy; it’s just a different, and more useful, way of thinking about

your pain. When your pain isn't responding to medical treatment, your only hope may be to learn how to change whatever neurological and psychological factors are contributing to your pain.

Stress and pain

The key to understanding chronic pain lies in understanding human needs and functioning, and how stress affects your brain. Basically stress is anything that threatens your ability to satisfy your survival needs. Stress impacts upon your nervous system, leading to increased arousal and alertness. Some amount of stress is to be expected as part of life, but we are not meant to exist in a permanent state of arousal. Severe stress causes permanent biochemical imbalances, sleeping problems, anxiety and depression, and increased sensitivity to pain. It's also been discovered that severe stress changes the way your brain processes information, including delayed reaction times, concentration and memory problems, impaired decision-making, etc. Stress, pain and your brain are thus an overlapping cause-and-effect system wherein stress impacts on your nervous system, which impacts upon your health, which affects how you feel, and so on. Viewed this way, stress is involved in pain at all levels of human functioning, including physical, emotional and social. Experts have come up with five main types and effects of stress which lead to pain:

- 1** lack of safety and support
- 2** emotional disconnection
- 3** increased physiological arousal
- 4** negative thinking
- 5** trauma (pain memories).

It doesn't take much to figure out how these factors might lead to pain. For example, lack of safety and support, such as unresolved post-traumatic stress or inadequately managed pain, means you can never relax, which causes tension, which exacerbates pain. Emotional disconnection makes it harder to regulate negative feelings associated with stress and pain, leaving you more vulnerable to these problems. Increased physiological arousal involves biochemical imbalances among other things, including increased levels of substance P, a neurotransmitter which increases your perception of pain. Stress-related sleeping problems cause fatigue, which also increases your sensitivity to pain. Traumatic stress involves significant physiological and emotional changes, wherein pain can occur as part of an unresolved traumatic memory. Severe stress also triggers changes in brain structure and functioning, such as decreased communication between the left and right hemispheres, and decreased ability of the brain to regulate itself. We will look more closely at the mechanisms by which the effects of stress lead to pain in the following three chapters.

How to use your brain to change your pain

Knowing how your brain works, and how the effects of stress on your brain can maintain pain, opens the way to new methods of controlling pain. They involve strategies which are specifically designed to target the different types and effects of stress, and neutralize the learned sensory-emotional patterns that maintain stress and pain. These strategies take advantage of neuroplasticity — your brain's capacity to be changed by experience. These strategies are also designed to work *with* your nervous system in terms of how it processes information to release stress and pain. Based on what we know about stress, pain and the brain, there are five basic strategies for overcoming pain:

- 1 safety and support
- 2 reconnecting with your feelings
- 3 learning how to control stressful feelings and pain
- 4 changing your thinking
- 5 building resilience.

It should not seem strange to think of pain as being maintained by changes in the brain and to use this as a basis for treatment. We are all amateur neuropsychologists. We smoke and drink to calm ourselves down; we take stimulants to perk ourselves up. We take antidepressants to correct the chemical imbalance that is supposedly causing our depression. If we are really smart, we exercise to increase our endorphins (natural pain-relieving chemicals) and/or meditate to reduce our levels of stress hormones. Most of these strategies are pursued with, at best, only a vague understanding of how what we are doing might be helping the mental and emotional processes that maintain physical and emotional pain. Knowing how we work, and how stress affects us, enables us to take a much more intelligent approach to overcoming pain.

Safety and support

People mainly tend to think of pain management in terms of getting rid of the hurt; however, there are certain conditions you must satisfy in order to be able to do this. Imagine you fell and sprained your ankle, but then you noticed a gang of thugs coming toward you. What would be your first concern? You would want to get out of danger first. So the first priority is to deal with any clear and present danger, or threats to your safety and well-being. If you suffer from chronic pain, this might mean reviewing your pain-management strategies to ensure you have adequate control over your pain. If you are unsure about your diagnosis, it might mean seeking further investigations. If you live or work in an unsafe place, it might mean taking action to make your living conditions safer. Take a moment to

think about what situations or events make you feel threatened or unsafe. What is stopping you from overcoming that threat? Is there anything more you need to do to protect yourself? The more safe you feel, the less stressed you will feel. The less stressed you feel, the less pain you will feel.

Reconnecting with your feelings

The next step is to reconnect with your feelings. Many sufferers of stress and pain have either never learned to feel, or they have disconnected from their feelings as a way of coping. Although emotional disconnection starts out as an attempt to cope with stress, over the long term it actually perpetuates the problem. There are a number of reasons for this. Feelings are necessary for integrating experience; without feelings we cannot learn and change. Being connected with your feelings also gives you more control over them; when you feel depressed you can pull yourself out of it by doing or thinking of something that makes you feel happy.

Reconnecting with your feelings means developing “emotional intelligence.” Emotional intelligence begins by paying attention to your body and learning how to recognize the physiological signs of different emotional states. The more “in tune” you are with your feelings, the more able you will be to manage pain and stress. For example, take a moment to focus on how you are feeling right now. Notice any feelings of stress, fatigue, sadness, etc. Without judging or analysing, just notice your pain. If you can do this, you will notice that just the act of not judging your pain takes away some of its sting. Next, again without judging or analysing, try to interpret what your body is signaling through those feelings. Now, think about how you can give yourself what you need to alleviate that pain, even if it’s only out of your memory or imagination.

Changing your pain

Once you are stable and able to listen to your feelings, you are ready to learn how to change your pain directly. Based on what we know about how the brain processes information, the most direct and powerful way to change your pain is to direct your attention *away* from your pain and *toward* something that makes you feel different, preferably happier or more relaxed. It could be a memory of happier times; it could be playing with your pet dog, or listening to music. When you concentrate on something pleasant, you change the way your brain perceives the pain. Joanne felt overwhelmed by her pain and the future seemed hopeless. However, when she remembered how she and her husband renovated the old house they’d bought as their first home, it brought back feelings of efficacy and joy, which made her feel less overwhelmed by her pain.

Another strategy for changing how you feel is dual attention stimulus. Dual attention stimulus is a treatment element of eye movement desensitization and

reprocessing (EMDR), a memory processing treatment developed by Francine Shapiro, PhD. We will talk about EMDR in more detail later, but for now all you need to know is that dual attention stimulus (DAS) involves focusing on the pain or stress while simultaneously concentrating on an external bilateral stimulation (BlS). This unique combination of stimuli has been found to reduce the physical and mental distress associated with stress and pain. If you have ever had the experience of paying attention to a neutral, bilateral stimulus while simultaneously recalling or thinking about something stressful, you have had some experience of this technique. An example would be tapping your knees while waiting for a job interview, or going for a walk (especially on a beach) when feeling stressed. You might recall feeling somehow calmed by the bilateral stimulus provided by tapping or walking.

The next time you feel bothered by pain, instead of avoiding or resisting it, try “just noticing” it in a detached way and at the same time hum, tap yourself, or focus on rhythmical sounds such as rain, a recording of ocean waves, or the bilateral stimulation track (Track 4) on the CD that comes with this book. Initially, do this for about 30 seconds to a minute, then take a deep breath and re-focus your attention back on the pain. *Don't try to make anything happen while focusing on the BlS; just pay attention to it and let whatever happens happen.* If you really pay attention to the BlS, you will almost certainly notice either a difference in the intensity of your pain, or a change in how you perceive your pain—it will seem further away and less important.

Changing your thinking

Stress and pain can trigger negative attitudes and beliefs, which can reinforce emotional and behavioral aspects of these problems. Negative thoughts are self-defeating attitudes and beliefs, such as “I’m bad”, “I’m weak”, “I’m helpless”, etc. Such beliefs are often unconscious, meaning that we don’t necessarily go through life having those thoughts “out loud”; however, we may feel anxious, helpless and/or inadequate, and negative emotions tend to incorporate negative attitudes and beliefs about ourselves. Negative attitudes and beliefs can also be reflected in our behavior, such as when we fail to take action to help ourselves, or when we engage in self-destructive behavior such as overworking, or abusing drugs or alcohol. Negative thinking can contribute to pain by making us believe we are weak, that things will never change, or that only bad things ever happen.

Changing your thinking can lead to more effective coping and decision-making. Changing your thinking is not an abstract, intellectual exercise. Changing your thinking is an aspect of emotional intelligence. For example, Harry felt overwhelmed and depressed as a result of not being able to work because of chronic pain, but when a friend pointed out to him that at least he was now able to spend more time with his young children when they most needed him, it made him feel less depressed.

Harry's children were the most important thing in his life, and he had to admit that since he had been at home his relationship with his children had improved. As a result of feeling less depressed, Harry's thinking changed; he realized that he could still make a contribution, and this made Harry feel better about himself.

Changing your thinking means more than just "happy talk"; it involves stimulating new emotional responses by changing attention, perception and behavior. Although it's normal to feel sad and anxious about having chronic pain, you need to be able to put aside these feelings sometimes and think about those aspects of your life or yourself that have survived the pain. Examples include personal qualities such as courage, persistence, caring for others; or relationships such as being a parent, sibling or friend. Honestly ask yourself what those enduring qualities or relationships say about you as a person. Then, the next time you feel overwhelmed by negative thoughts, remember those qualities and what they say about you.

Building resilience

Some people are able to withstand adversity, injury and/or pain and move on with seemingly few problems. This ability to "bounce back" from adversity is known as resilience. Resilience comes from a combination of personal and social qualities including temperament, family background, education and cultural factors. Resilient individuals tend to possess many of the above-mentioned stress-management skills including emotional regulation skills, a positive attitude and an ability to transform negative events into useful learning. Although resilience is hereditary to some degree, it can also be learned. Resilience can be developed through building and maintaining strong family and/or community ties, having goals, knowing how to turn problems into strengths, etc. Resilience doesn't alleviate pain and stress directly, but it creates a powerful buffer against these problems, and a strong foundation from which to build coping strategies.

After social support, perhaps the best thing you can do to increase your resilience is to find some means of transforming your painful circumstances into something useful. While he was temporarily disabled as a result of a fractured spine, Rodney taught himself memory techniques out of a paperback a friend gave him. By the time Rodney was back on his feet, he could remember over 1000 items of information, a skill that enabled him to earn a living as a memory expert. Instead of focusing on the negative effects of your pain, remember some past achievements and what they say about you. Think about what you can still do that is purposeful and meaningful.

Five things you can do right now to start feeling better

The aim of the preceding five strategies is to neutralize the processes that maintain stress and pain. At the heart of this approach is a belief that your nervous system either knows or has the capacity to learn how to feel better. It's important to remember too that you are not really meant to be in a constant state of pain or stress and that you have the capacity to learn how to overcome these problems. So to summarize, here are five things you can do immediately to start reversing the brain activity/processes that are maintaining your pain.

- 1 **Detachment:** Learn how to separate how you think from how you feel. Pain is unpleasant. It can make you feel stressed, anxious and depressed. While perfectly normal, these reactions can also exacerbate pain by feeding negative emotions into an already unpleasant sensory experience. Imagine your breath as a conduit to your pain and that with each inward breath you make contact with your pain, and with each outward breath you let go of your pain, a bit at a time.
- 2 **Stop thinking:** Learn how to live in the now and accept reality without judging it. Pain triggers negative thinking, worry and doubt. While worry is an understandable reaction to a threat such as pain, after a while it only clouds your judgment and adds to your anxiety. Isn't your current pain enough to deal with without adding to it by worrying about tomorrow? When you stop worrying about your pain, you remove a significant component of emotional distress.
- 3 **Make friends with your feelings:** Learn how to absorb feelings—not just pain but *all kinds* of feelings. Pain starts out as a warning signal, to alert you to injury and prompt you to take action such as resting or protecting the injured area. In that way pain is your friend. Pain can persist for many reasons including undiagnosed pathology, emotional distress and biochemical imbalances. Maybe you need to learn how to manage stress better, deal with depression or get more sleep. Find out what's maintaining your pain and what action or skills are needed to address it.
- 4 **Focus your attention on something else:** Pain can dominate your mind. Although pain is important, after a certain time focusing on it just makes you feel worse. There are many other things you can pay attention to that will make you feel less pain and stress: your breathing, a happy memory, a physical stimulus such as tapping, a beach or a waterfall. Without denying the reality of your pain, shift your attention to remembering or doing something that triggers different feelings to those associated with the pain.
- 5 **Review your levels of safety and support:** Sharing your feelings, whether negative or positive, with someone close is one of the most powerful long-term antidotes to chronic physical and emotional pain. Shared

emotion stimulates the same parts of the brain as those involved in physical pain, in a positive way. Seek out someone you feel close to and have a conversation.

Don't worry if you aren't sure how to put all of the above strategies into practice yet. You will find more detailed information and exercises in the second half of the book which will help you develop the skills necessary to implement them.

Conclusion

The aim of this chapter has been to introduce you to the notion that your pain is in your brain as much as it is in your body, particularly if you have suffered severe stress. You should now have a rough understanding of the five main physical and emotional effects of stress and how they lead to pain. You have been introduced to a new way of managing pain, in the form of five strategies designed to neutralize the pain-maintaining effects of stress on your brain, plus five practical steps that you can implement immediately to start feeling better. Obviously there are no quick or easy solutions to chronic pain and stress, so the rest of this book is about how to apply these five strategies in more detail. But before that we need to look a little more deeply at how stress affects your brain, and the role of memory and emotional functioning in maintaining pain. Understanding the causes of a problem makes it easier to know how to overcome it.