



Plan A - Thrive and Survive COVID-19

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OVERVIEW

The main problem with the COVID-19 virus is not that we catch it, but that it is so deadly that it can kill you.

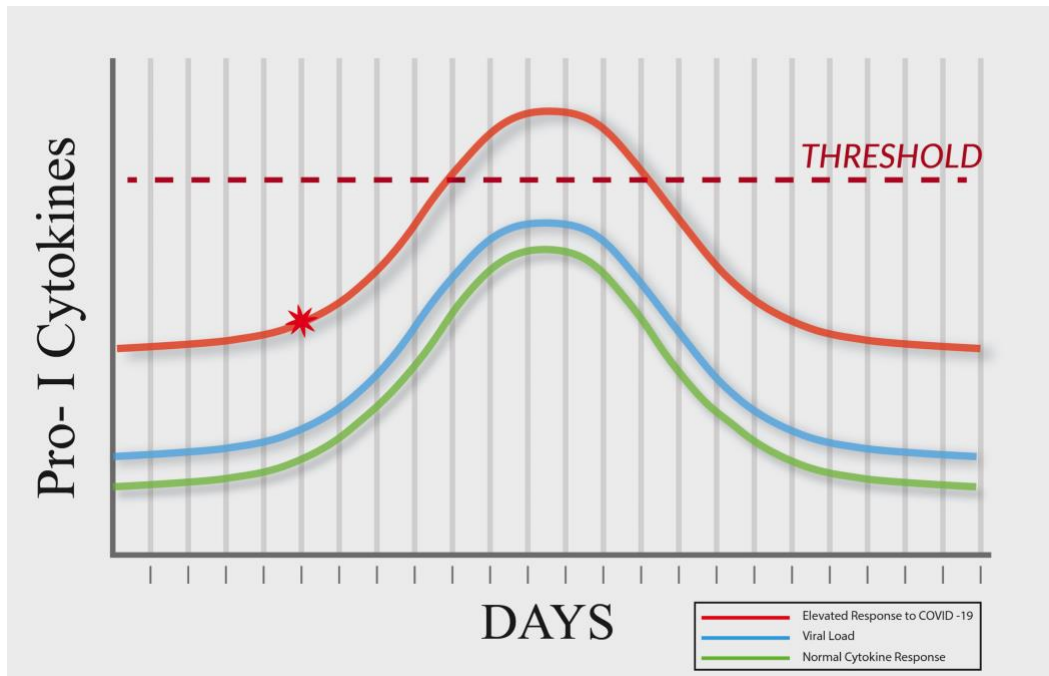
There are two ways of stopping a deadly pandemic. One is through developing immunity, either by exposure to the virus or by inoculation with a vaccine. The other is simply to prevent people from dying. The key is to prevent the inflammatory response from reaching a level that destroys tissues and its host's organ systems. The graph below illustrates the issue.

CYTOKINES

Cytokines are small proteins that serve as messengers, transmitting higher-level signals and coordinating activities at the cellular level. They are central to modulating the immune system and inflammatory response. There are two kinds of cytokines: pro-inflammatory (Pro-I) and anti-inflammatory (Anti-I). While Pro-I cytokines protect us by warding off acute perils, Anti-I cytokines keep us safe by allowing us to regenerate, thrive, and prepare us for battle with environmental enemies.

Both Pro-I and Anti-I cytokines are necessary for survival—one to defend against threat, the other for growth and regeneration. However, sustained elevations of Anti-I can destroy parts of the body and give rise to chronic mental and physical disease. In acute situations, levels of Pro-I may spiral out of control and cause failure of multiple organs. This is the cause of ARDS (adult respiratory distress syndrome), the most common cause of death from corona virus, which impedes the lungs from providing oxygen to the blood, resulting in a high mortality rate.

One term used to describe the excessive elevation of the inflammatory cytokines is “cytokine storm.” It is unclear whether there really is a “storm” or whether the normal rise of already elevated cytokines pushes people over the critical threshold of tissue edema and destruction.



Graph by D. R. Clawson, MD

Pro-I's are elevated in almost every chronic disease state. In one example, researchers discovered that even some types of depression are inflammatory responses of the central nervous system (Simmon). So, one way to successfully address chronic illness is by stimulating the protective cytokines, Anti-I's.

Any threat will elevate Pro-I's. That is the desired, normal response and is usually successful in protecting you from harm. However, the COVID-19 virus can induce that same defensive reaction to spin out of control and kill you. The goal of treatment, aside from defeating the virus, is to prevent the levels of pro-inflammatory cytokines from crossing that fatal point of no return.

There are two ways to accomplish this goal. One is to arrest the production of Pro-I's before the level of inflammation reaches a crisis point. In the graph, the horizontal dotted line represents the level of inflammation where cytokines cause severe damage to body organs. Once that threshold is reached, mortality rate is high. The asterisk (*) represents the point where interventions to halt this "cytokine storm" are being explored. There are definite possibilities.

The other approach is to ensure that patients begin with a lower cytokine load in the first place so that, should the Pro-I's rise as expected when faced with COVID-19, the level of elevation does not cross the critical threshold. There are several strategies to this end that can be easily pursued by any of us.

It is first important to understand the nature of threat.

THREAT

Any mental or physical threat, perceived or real, is going to be met with a defensive response from your body. Much of this is mediated through the vagus nerve, at the core of the autonomic nervous system. The response is the well-known flight, fight, or freeze reaction (Porges). We are all familiar with the physical manifestations of increased heart rate, sweating, muscle tension, elevated blood pressure, etc.

But what you may not know is that the immune system also gets fired up and mobilizes many types of cells that fend off predators such as bacteria, viruses, and cancer cells. The result is inflammation where the “warrior cells” exit the blood stream through widened openings in the vessels to destroy the invaders (antigens). Cytokines are small proteins that are the “switches” that activate and deactivate this response.

Although threats come in many forms, they always activate pro-inflammatory (Pro-I) cytokines. Physical threats include allergens, parasites, bacteria, viruses, lions, tigers, bears, and people we perceive as dangerous. Less obvious but even more inflammatory are mental threats, because we can’t physically escape them. They create a sustained inflammatory response that forms the basis for chronic mental and physical disease. Examples of mental threats are memories, negative thoughts, suppressions, repressions, insecurities (social, financial, health, etc.), cognitive distortions, and loss of life perspective and purpose (Coughlin).

Discovery and acknowledgement of all our threats--whether real, imagined, anticipated, or repressed--is the first step towards addressing them. The second is choosing an adaptive rather than a maladaptive escape to safety, whether the threat be physical or spiritual. We are better at physical escapes to safety than we are at spiritual ones (Fredheim). If you don’t feel safe and peaceful, you are carrying elevated levels of cytokines. If you encounter the additional threat of a COVID-19 infection, you will have less chance of surviving, since you’ll already be closer to the critical threshold. There are several distinct ways to reduce your inflammatory cytokines.

LOWERING YOUR CYTOKINES

Below I have outlined **ten areas** to address to reduce your inflammatory cytokines. First, I am going to summarize them, and then I will discuss section in more detail. Each method will lower your pro-inflammatory response (Pro-I’s) and thereby improve your chances of surviving the COVID-19 infection.

1. **Understand and treat anxiety.** Anxiety is simply your body signaling danger. It is the sensation generated by elevations of your stress hormones, activation of the sympathetic nervous system, elevated Pro-I’s, and the inflammatory reaction. It is *not* a “psychological issue,” although mental threats are more likely to over-stimulate the nervous system than physical ones. Remedies for anxiety will be discussed below.
2. **Get adequate sleep.** At least seven hours a night of restful sleep lowers your stress response and inflammation levels.
3. **Employ expressive writing.** You can’t control your thoughts and emotions but writing them down and then immediately destroying them separates you from disruptive thoughts. The practice has a remarkable impact on both mental and physical symptoms.
4. **Practice forgiveness.** Anger creates a powerful neurochemical reaction with marked elevations of Pro-I’s and inflammation. The anger experienced while feeling trapped is particularly deadly. (Copeland, Takahashi). There is no shortcut to overcoming anger and it needs to be dealt with clearly and quickly. You also must address your deepest wounds. Do you want the person or situation you hate the most to be what ultimately kills you? Who would win?
5. **Follow an anti-inflammatory diet.** It consistently lowers Pro-I cytokines.
6. **Decrease stimulation of your nervous system.**
 - a. Limit watching the news.

- b. Avoid watching violent and over-stimulating shows, especially at night. Just witnessing violence will increase Pro-I's.
- c. Stop negative talk, such as complaining, gossiping, discussing your medical problems or care, giving unasked-for-advice, and criticism.

7. Maintain an exercise regimen.

- a. At least 30 minutes a day
- b. Moderate and enjoyable

8. Stay on top of your medical problems.

- a. Control your diabetes.
- b. Take your blood pressure meds.
- c. Comply with all of your recommended medical treatments.
- d. Stay in touch with your doctor, even about issues you consider minor.

9. Directly address family issues. All families trigger each other, but there are many effective ways to create a structure that will minimize conflict.

- a. Living in chaos is not only unpleasant; it also has a negative impact on your health.
- b. Your family is usually the source of your most powerful triggers.
- c. Be nice! Any member of your family who feels trapped is at higher risk for an illness or chronic disease.

10. Play. Having fun is one of the most powerful ways to stimulate the production of Anti-I's and relaxation hormones.

SECTION 1 - UNDERSTAND AND TREAT ANXIETY

In a nutshell, anxiety is the unpleasant sensation you feel when your body prepares to fend off a threat. It is not a psychological problem, but rather an involuntary neurophysiological response to real or perceived danger. Anxiety allowed us to evolve and survive. But since it is not in itself subject to conscious control, the only way to deal with anxiety is to understand how it works and then use self-directed tools to lower your stress chemicals and inflammatory response. Without comprehending the powerful physiological nature of anxiety, it is impossible to treat. It may eventually disrupt your life, with severe consequences.

UNDERSTANDING ANXIETY

Avoiding threats

The central nervous system maintains the delicate balance of your body's chemistry and sends signals to different organs and glands when it perceives that you are in danger. Your body secretes hormones, such as adrenaline, histamines, and cortisol, and releases pro-inflammatory cytokines (Pro-I's). The result is an increased capacity to flee from danger, modulated by the autonomic nervous system, which also induces responses such as increased heart rate, provides fuel (glucose) to flee, rapid breathing, dilation of certain blood vessels and constriction of others.

All these functions give you the ability to leap into action, but what *compels* you to do so? It is that feeling of dread that we call anxiety. The sensation is so uncomfortable that you are compelled to take action. Once the threat is gone and the body chemistry is back in balance (homeostasis), you can go on with your life. Anxiety merely is the sensation generated by body's response to a threat. It is a description—not a diagnosis, disease, or disorder.

Seeking rewards

Conversely, survival depends on engaging in behaviors that allow you to flourish and procreate. It is enjoyable to eat, quench your thirst, inhale a breath of fresh air, take a nap, empty a full bowel or bladder, make love, and spend time with close friends and family. When you are lying in the sun or holding your newborn baby, your body is full of reward chemicals such as oxytocin (love drug, bonding), dopamine (rewards), serotonin (mood elevator) and GABA chemicals (anti-anxiety). Your heart rate is slower and your muscles are loose. What a great chemical bath. There are also numerous anti-inflammatory cytokines (Anti-I's). Many words encapsulate this scenario, but the one I prefer is "relaxed." Relaxation is the antithesis of anxiety. The cumulative sensation is security and safety and is also just a description.

Shifts in your body's chemical balance occur by the millisecond, and chronic illness and disease occurs when the balance is disrupted by sustained levels of stress hormones and Pro-I's. This assertion has been supported by the data for decades (Cohen, Rahe).

"The Curse of Consciousness"

The universal problem of being human is what I call, "The Curse of Consciousness." Recent neuroscience research has shown that threats generated by unpleasant thoughts or concepts are processed in a similar area of the brain and with the same chemical response as physical threats (Eisenberger). The "curse" is that none of us can escape our thoughts, so our bodies are subjected to an endless neurochemical assault. This translates into more than thirty physical symptoms (Schubiner) and many

disease states, including autoimmune disorders (Song) and early death. However, the most intolerable symptom is relentless anxiety.

Is “relaxed” a diagnosis? No. Is “anxious” a diagnosis? No! Anxiety is the essence of life. It allowed us to evolve and now ensures survival.

TREAT IT—NOW

Treatment can be considered from two perspectives. One is providing symptomatic relief and the other is to learn tools to lower your sense of threat.

Symptom relief

It is important when managing any chronic illness to provide relief from uncomfortable symptoms in order to allow the “space” to absorb the concepts, learn tools and let your brain change. For example, when I was the primary resource for my spine patients suffering from chronic pain, I would maintain the same dosage of all of their medications. Immediately decreasing opioids would increase their anxiety and pain. I wanted to minimize symptoms while they healed. I rarely had a problem weaning patients off high-dose narcotics because as their pain diminished, they no longer wanted to be on meds. In retrospect, I was addressing their anxiety in several ways:

- I got to know my patients well enough that they felt safe.
- We always addressed sleep issues first.
- I would prescribe anti-anxiety medications such as Xanax for a few months. It was helpful in calming them down and their pain would drop. Currently, cannabinoids may be a better choice.
- They stayed on the same narcotic dose and controlled the rate at which they weaned themselves off the drug. Any breaches required a face-to-face visit. Feeling in control helped decrease their anxiety.
- As their pain decreased they would frequently come off all meds. Time frames varied considerably. At the time, I did not realize that their anxiety was their pain.

Obtaining symptomatic relief from anxiety can be very helpful in allowing you to engage in the other healing practices. I recommend asking your doctor for help. Choices include:

- Benzodiazepams in low to medium dose, understanding that it is only temporary
- Cannabinoids (CBD)
 - CBD helps with both sleep and anxiety
 - Dosing and exact type unclear
 - Also has an anti-inflammatory effect (Papagianni)
 - Safer to use than benzodiazepams
- Antidepressants can be effective, but they have a slower onset and less predictable response.
- Neurontin/ Lyrica
 - Anti-seizure drugs that are membrane-stabilizing
 - Can be effective with anxiety
 - Don't stop suddenly—can precipitate acute anxiety reactions

Reducing your anxiety = Lowering your response to threat

How can you reduce your anxiety if you can't consciously control it? If anxiety is the feeling generated by stress hormones and Pro-I's, the only way to decrease your anxiety level is to reduce your levels of stress hormones and Pro-I's themselves.

THE FIRST STEP: DETACHMENT

Anxiety is a characteristic that you possess, but not who you are. The survival response is powerful and amoral with one task—to keep you alive. Who you are is your conscious brain, which has the smallest fraction of processing capacity compared to the unconscious brain.

While you can't avoid anxiety, you can separate from it. For example, as you begin to feel anxious, you might visualize a large thermometer on a wall and imagine that the gauge represents your levels of stress hormones and Pro-I's. As you watch the "temperature" rise with your level of anxiety, learn to use the phrase, "elevated threat response" rather than "anxiety." Remind yourself that this reaction to a real or perceived threat doesn't define you. Permanently replace the word "anxiety" with the term "threat response."

THE SECOND STEP: DAMPEN THE STRESS RESPONSE

When it comes to anxiety, the problem is not the threat as much as it is your neurochemical reaction to it. There are two avenues to optimize your chemical profile. One is through tools such as mindfulness, visualization, deliberate relaxation strategies, better sleep, meditation, and exercise. The other approach involves stimulating neuroplastic changes in your nervous system.

Direct Methods

The following are strategies to deal with day-to-day stress. Find ones you enjoy and can commit to. The only mandatory one is expressive writing.

- Expressive writing—the foundation and starting point (discussed below)
- Mindfulness
- Active meditation—focusing your attention on a bodily sensation for a few seconds, an abbreviated version of mindfulness that can be used while you are on the go.
- Meditation practice
- Visualization
- Martial arts
- Exercise
- Listening—more productive than re-hashing your own views

You might be asking yourself, "I've already heard about all of these, so what is new?" The answer is "Maybe nothing." But few of us actively engage with very much of it. The key is to consistently incorporate some or most of them into our daily lives.

Stimulating neuroplastic changes

Changing your brain (neuroplasticity) to respond differently to threat is another important approach to reducing anxiety. Instead of constantly generating a reaction to threat via an automatic survival mechanism, you can learn how to create distance between the stimulus and the response. Once you create this space, you can substitute a more functional and appropriate response.

The steps to accomplishing this shift are 1) awareness, 2) separation, and 3) re-programming. “Positive thinking” doesn’t work because it suppresses awareness. However, positive *substitution* is key. One metaphor is that of learning a new language. If you want to learn a new language, you can’t accomplish it merely by refraining from speaking English. Your brain will not develop new circuits by trying to alter old ones. In fact, the attention you pay to “fixing” yourself will only reinforce the existing circuits—your native language.

Here some examples of ways to “reprogram” your brain. Participating in these activities stimulates creativity and growth.

- Reconnecting with the best part of you
- Re-engaging with favorite arts, hobbies, music, dance, sports, etc.
- Spending quality time with family and friends (53% of Americans are socially isolated [Cigna].)
- Re-learning how to play
- Resolving never to discuss your chronic pain, complain, criticize others, or gossip. Your brain will develop wherever you place your attention.
- Somatic work—associating thoughts with physical sensations
- Creating a detailed vision of how you want your life to look
- Getting organized, in order to execute your vision.
- Giving back—there are endless possibilities.

Again, you might wonder, “How can these types of interventions make a difference?” You are decreasing threat and nurturing safety. It alters your physiology. It has been demonstrated that the brains of patients suffering from chronic pain physically shrink (inflammation destroys neurons); but when pain is successfully treated, the brain re-expands (Seminowicz).

SECTION 2 - GET ADEQUATE SLEEP

Restful sleep is paramount for both coping with stress and bolstering the immune system and cytokine load. We also know that lack of sleep induces chronic pain (Agmon). Here are some guidelines for acquiring regular, quality sleep.

SELF-DIRECTED

1. **Sleep hygiene**—a set of well-established basic principles to optimize sleep
Sleep is an important stress reducer at any age, but the older you become, the more important it is to practice good sleep hygiene. The ability to get a good night's sleep drops sharply around age twenty-five and then again at age forty-five. Follow these suggested practices to improve your sleep quality:
 - Wait until you are ready to fall asleep before getting into bed. Watch TV, read, etc. in another room.
 - Avoid caffeine after noon.
 - Minimize alcohol intake in the evening. It may help you fall asleep but not stay asleep.
 - No intense exercise in the evenings.
 - Remove any clocks from the room.
 - Do something relaxing just before going to bed.
 - If you are hungry have a light snack.
 - Concentrate on relaxing each muscle group in your body from head to toe.
2. **Stress management at bedtime**
 - Don't read your emails within an hour of bedtime. Many of them bring up situations that demand action and attention. Usually there is not much you can do at that point in time and it's better to look things over in the morning.
 - Leave smartphones and laptop devices in another room and don't bring them to bed or even into the bedroom. The light from them is stimulating; but if you must read from a device, use one that has a more calming screen.
 - Don't discuss controversial issues with your partner within a couple of hours of bedtime.
 - Read a good book, or, better yet, a boring one. My medical journals are some of my best sleep aids.
 - Avoid watching intense TV programs or movies before bedtime—or any time of the day, for that matter. You will produce adrenaline and more inflammatory cytokines.
 - Consistently include soothing activities in your day. Suggestions include listening to guided meditations, quiet music, sounds from nature, or an author reading a favorite book.
3. **Exercise**—overall physical conditioning, as long as it is not performed too close to bedtime.
4. **Expressive writing**—helps decrease the time it takes to fall asleep.
5. **Cognitive Behavioral Therapy Insomnia (CBT-I)**—can be performed online or in person. It is CBT focused specifically on sleep habits and has been documented to be effective.
6. **Over-the-counter sleep aids**—It is a reasonably safe starting point but should not be used or needed long-term. Let your physician know if you are using them.

UNDER THE GUIDANCE OF A PHYSICIAN

7. **Prescription medications**—Many medications are effective in dealing with insomnia. I have observed that chronic pain sufferers in particular often need a kick-start with fairly strong sleep meds. But once your nervous system quiets down, you can and should discontinue them relatively

soon. I would not recommend using narcotics to get to sleep, as they can create additional problems.

8. **Diagnosing a sleep disorder**—There are over a hundred sleep disorders, but the most common one is sleep apnea. In sleep apnea your airway becomes blocked while sleeping, and you wake gasping for air. As this happens several times during the night, sleep quality is poor and you are tired the next day. More importantly, sleep apnea has an adverse effect on your heart, so it is important that it be diagnosed and treated. Restless leg syndrome is another common sleep disorder that is treatable with the correct medications.
9. **Addressing past traumas**—At night, when there are fewer distractions to take your attention off pain and racing thoughts, past memories may flood your brain, keep you in a hyper-vigilant state, and generate nightmares. You may want to seek professional counseling to help process these issues.

Finally, take a “can do” approach to solving this issue. I saw very few patients who couldn’t consistently get a good night’s sleep within six weeks—with or without pain relief—if they committed to a deliberate, focused effort.

SECTION 3 - EMPLOY EXPRESSIVE WRITING

The more neuroscience research advances, the more emotions such as pain, anxiety, and anger are viewed merely as progressions of neurological circuits and physiological responses. Once embedded, these patterns cannot be consciously controlled, changed, or removed (Wegner). However, you *can* detach or separate from them and form “detours,” creating new, more functional circuits. In order to begin this process, you need to create distance between your thoughts and your embedded, automatic reactions.

WRITING BEGINS YOUR PATH TO HEALING

Expressive writing effectively creates distance between you and your thoughts. It also creates a keen awareness of your them, whether positive or negative, facilitates detaching from them. The effectiveness of this practice has been demonstrated in over a thousand research studies (Pennebaker). While we can't be sure exactly why expressive writing works so well in reducing anxiety and all its fallout, here are a few theories:

- Writing down your thoughts creates an association with your senses, particularly vision and touch. Associating thoughts with physical sensations forms new neurological connections.
- Writing down thoughts distances you from them.
- As your brain associates that distance with sight and touch, it establishes a physical basis for detachment from your thoughts.

Tearing up and destroying the page on which you've written your thoughts is the most critical step. First, you have total freedom of expression. More importantly, the reason to immediately get rid of them is to not analyze them.

THE STARTING POINT: FREE FLOW OF THOUGHTS

Record your thoughts and immediately destroy them.

- Write down specific thoughts. They do not have to make sense or even be legible. They can be positive, negative, rational, irrational--anything.
- Do this once or twice a day for 15-30 minutes per session.
- Resist the temptation to analyze your thoughts. The more attention you give them, the more you reinforce them. All the “issues” are just thoughts and it is counterproductive to place your attention on them. These neurological circuits are reinforced.
- Destroy the pages. Tear them up into tiny pieces and discard them where no one can read them. This step is critical if you are to write with complete freedom.
- Ordinary journaling or retaining these writings is counter-productive. One of my pain colleagues made a succinct observation that patients who held on to their writing held on to their pain. This is just an exercise, not to be confused with other forms of written expression.

THE NEXT STEP: ENHANCE WITH CBT (COGNITIVE BEHAVIORAL THERAPY)

After you have become comfortable with the free-writing exercise, try the “three-column technique,” outlined in Dr. David Burns' book, *Feeling Good* (Burns). It is an excellent format in which to apply the principles of CBT. He outlines ten “errors in thinking” that cover a range of cognitive distortions. These concepts combine expressive writing with cognitive behavioral therapy. The categories he lists are:

- “Should statements”
- All or nothing thinking
- Overgeneralization
- Mental filter
 - Ignore the positive
 - Dwell on the negatives
- Discounting the positives
- Jumping to conclusions
 - Mind reading
 - Fortune telling
- Magnification or minimization
- Labeling
- Emotional reasoning
- Personalization or blame

THREE-COLUMN TECHNIQUE

Before you begin to write, divide your page into three columns. In the first column, write down your “Automatic Negative Thought (ANT).” For example, say your son just flunked a test. Your first response might be, “He is lazy and stupid.” You would record that thought in the first column. This step increases your *awareness* of your disruptive thought, a key component of stimulating neuroplasticity.

In the second column, write down the “error in thinking” that the thought represents. As you categorize the thought and understand the effect it has on your peace of mind, you separate yourself from it. In our example, you would note that your thought represents the error in thinking called “labeling.”

In the third column, write down a more rational version of the thought. The more specific you are the better. This is precisely how you create new circuits and rewire your brain. Of your son, you might write, “My son just flunked a test. I wonder why. Is he being bullied at school? Could he be depressed? I am going to try to find out what is going on. He isn’t lazy. He is my son and I love him.”

When you are finished, immediately destroy your work (for obvious reasons).

By writing down your negative thoughts in this manner, and coming up with a more rational response, you are short-circuiting an automatic reaction that might not put you in the greatest frame of mind when you confront your son.

BENEFITS OF EXPRESSIVE WRITING

People who practice expressive writing usually experience a shift in anxiety and frustration within a short time. Using the three-column technique provides even more focus and structure. However, if the writing feels overwhelming to you, don’t do it. If you are in therapy, let your doctor know. It is important to coordinate these efforts with your therapist. He or she may not want you to do the writing.

Keep in mind is that, although the writing is only one step in the healing journey, but it is a necessary one. The benefits, which have been universally documented, are striking for such a simple exercise. Some of them include improved wound healing, decreased asthma symptoms, better memory and school performance (Baik), lower viral load (Petrei), improved autoimmune function, decreased depression, and decline or resolution of obsessive thought patterns (Wegner). This is just a small

sampling of the benefits. Please take a few minutes each day to practice expressive writing to begin your journey out of pain—and lower your pro-inflammatory cytokines.

SECTION 4 - PRACTICE FORGIVENESS

As we saw earlier in our discussion about anxiety, *anxiety creates a need for control*, letting loose a dangerous sequence. *Anger arises when aggressive effort is needed to exert control*. When the effort is successful, the body's chemistry returns to normal. *If the situation cannot be resolved, anxiety and anger continues, with ongoing inflammation*. In other words, feeling trapped (whether real or perceived) is deadly to the organism. People sicken and develop life-threatening diseases as the result of chronic inflammation.

When confronted with a threat, you'll have anxiety that you may or may not be aware of, but your first impulse is to defend yourself. This is the fight response, necessary for survival. You will experience some level of upset, ranging from slight annoyance to all-out rage. Your body elevates Pro-I cytokines and stress hormones to increase your odds of success in defending yourself. Your dopamine (rewards) and testosterone levels also increase.

While anxiety reveals your vulnerability, anger covers it up. Anger precipitates actions to regain control—whether these actions are commendable or not is a different discussion. Even if regaining control is out of the question (and you can't control your thoughts), anger allows you to feel as if you are in control. What's more, anger is nearly impossible to relinquish. Nor should you—it is a normal survival reaction.

If anger actually helps you to regain control or have more power, your Pro-I cytokines will drop, and anti-inflammatory ones will increase. For example, bullies have lower than average inflammatory markers and those who are bullied have elevated ones (Copeland, Takahashi). There is a physiological reward for power, and the consequences for feeling powerless and trapped for any reason are severe.

Several studies have shown that the vast majority of people in chronic pain still blame the person or situation that caused their injury. Interestingly, the person they often blame the most is themselves (Carson). Research has shown that anger not only obstructs healing, but also lowers pain thresholds and increases pain (Takahashi).

Anger lives in many forms, and it is your role to identify and confront it within yourself. By being aware of your anger and understanding how powerful and potentially destructive it can be, you can learn to separate from it and avoid unleashing its destructive power. The bottom line is that you are not going to mentally or physically heal until you can confront and process anger and truly calm down.

ADDRESS YOUR ANGER

Here are some suggestions to begin your process. Each person will have a unique approach and experience.

1. Understand the impact of anger on your life

Renowned psychologist Abraham Maslow focused on normal human behavior as the basis for his theories. He developed a "hierarchy of needs," citing basics such as air, food, water, and sleep. But what he omitted was "not being in pain." When a basic need continues not to be met, anger can evolve into rage. Anger will consistently destroy almost every good part of your life.

2. Acknowledge your disguises

Disguising victimhood is a highly developed “skill” for most of us. Remaining aware of this tendency is a daily practice. How do you disguise yours?

3. Admit your victimhood

There is a genealogy of anger/frustration:

- Circumstance over which you have lost control
- Laying blame
- Assuming a victim role
- Frustration and anger

Many people are not aware they are playing a victim role. We dislike both the word and its implications. But the tendency is universal, and it is important to understand your style of dealing with it. A lack of awareness can and will control you.

4. Choose to reject victimhood

You simply have to make the choice to give it up. Being a victim is a powerful way to gain control, so it is no surprise that it is so difficult to let it go.

FORGIVE

This step is where you have an opportunity to change your life and thrive at a level you have never known before. Remaining upset, regardless of the reason, keeps your body full of stress hormones and elevated levels of Pro-I's with significant negative consequences. Conversely, if you cannot move on, you truly are stuck. You must especially forgive the person or situation that has treated you the worst and forged your deepest wounds. Be kind, and don't forget to forgive yourself.

One excellent resource is Dr. Fred Luskin's book, *Forgive for Good*. Dr. Luskin has committed his career to researching and teaching forgiveness, and his book lays out a clear path to effectively processing anger.

SECTION 5 - NUTRITIONAL CONSIDERATIONS

ANTI-INFLAMMATORY DIET

A nutrient-dense diet centered around whole foods that include fruits, vegetables, whole grains, nuts, seeds and plant-based sources of protein, supplemented by herbs and spices, is extremely healthy. These whole foods are high in fiber, phytonutrients, and good fats, and more than meets one's protein requirements, thus significantly improving immunity and decreasing inflammation.

On the other hand, calorie-dense diets such as the typical western diet are high in processed foods and contain significant amounts of saturated fat and salt, are low in fiber, and have few of the health-promoting nutrients found in a more plant-based diet, thereby promoting inflammation and weakening immune function.

Regardless of your weight, an anti-inflammatory diet will contribute to lowering your levels of inflammatory cytokines. However, the issue of being overweight needs to be separately addressed, as fat cells increase your Pro-I cytokine load and contribute to adult-onset diabetes.

INTERMITTENT FASTING

Being overweight is especially hard on your health, especially if your body mass index (BMI) is greater than 35. BMI is a calculation based on your height and weight, and you can easily look yours up on the Internet (for example, at [cdc.gov](https://www.cdc.gov)). The ideal range is from 18.5 to 24.9. A BMI between 25 and 29.9 is considered overweight, and over 30 is considered obese. The greater your BMI, the higher your risk for chronic disease.

Intermittent fasting has been consistently associated with lowering inflammatory markers. The intervals vary. One approach is fasting for two out of seven days. Another schedule is fasting for 16-18 hours daily, which basically means skipping one meal every day (de Cabo).

Dieting is always difficult, but many find that intermittent fasting is not as challenging as the other alternatives. Even if you only partially engage in this approach, it will help. Don't overlook this simple strategy.

SUPPLEMENTS

Vit K2 – 1000 mcg daily

Vit C – 500 mg three times per day

Vit D – 5000 units daily – Low levels are associated with a higher COVID-19 mortality

Vitamin B's

Zinc 5 mg every 8 hours

Magnesium – 400 mg per day for adults – critical for enzyme function

For a surgeon to be discussing nutrition is ironic, since we seldom have enough time to eat, much less think about what we are eating. I do not pretend to be an expert on the topic, but I find the data on the anti-inflammatory diet consistent and compelling. The fact that it can lower your inflammatory markers has been well documented. To find reliable information that can both educate and guide you, visit the website: <https://nutritionfacts.org/topics/inflammation/>.

SECTION 6 - DECREASE STIMULATION OF YOUR NERVOUS SYSTEM

A sensitized nervous system creates anxiety, so the approaches described in the anxiety section are the first step. However, it is important to be mindful of activities you engage in that also fire up your brain. It is not a matter of right or wrong. The point is to observe the effects on your nervous system. Consider what you feel happening to your body when you:

- Play intense video games or watch violent movies
- Argue with family members
- Watch news that upsets you

Some suggestions to keep calm are:

- No discussing your pain or medical care with anyone except your health care providers.
- Limiting the time that you spend watching news and other over-simulating programs.
- Choose less intense video games.
- No complaining about anything, including the pandemic.
- No criticizing anyone. You are simply projecting your view of yourself onto them.
- No offering advice that is not requested. How do you feel when you are on the receiving end?
- No gossip.

Work on increasing your awareness of these behaviors. We all engage in these negative patterns of communication from time to time, and it takes a deliberate effort to change a behavioral pattern. In short, be nice, regardless of the circumstances. *There is no action in a reaction.*

Here are five easy tips to sooth your nervous system and lower your stress reaction:

- A cold compress to the face (Mäkinen), especially after exercising or if acutely stressed.
- Meditation with deep breathing. Try using a counting method (such as 4 counts breathing in and 4 counts out; or 4 counts in, hold for 7, and release for 8); alternating nostril breathing (block one nostril while breathing in and the other nostril while breathing out); or just focus solely on your breath (Mason).
- Singing, humming, or chanting (Vickhoff)
- Socializing (Kok)
- Laughing with your “tribe” or watching comedic movies (Berk, Miller).

The bottom line is to use common sense to actively calm yourself and avoid activities that stress your nervous system. It is surprising how much difference it can make.

SECTION 7 - PHYSICAL INTERVENTIONS

EXERCISE—CONDITIONING

Regular exercise improves almost every aspect of life, including sleep. Activities can involve aerobics, resistance training, or both. However, per the sleep hygiene principles, intense exercise should not be performed in the evening. If you must exercise late in the day, keep it light and relaxing; otherwise you will trigger an adrenaline response, which greatly disturbs sleep.

The key to incorporating exercise into your care is to select an activity you enjoy from the start. Exercise is a long-term commitment and it is important to have fun while you do it. It's easy to look at your exercise equipment at home and feel bad that you aren't using it more than you should; but those thoughts are counter-productive to your healing. That's why I strongly encourage my patients to exercise outside their homes. If you reframe exercise as a reward comprised of leaving the house and moving your body, you're more apt to keep it up. Remember, exercise should be fun. Invite a friend to join you, take a neighbor's dog for a walk, accompany a grandchild to the park, join a local team—all of these activities allow you to connect not only with your body, but also with your community. The experience of connection in itself promotes a feeling of safety and lowers Pro-I cytokines.

BREATH WORK

There is a lot of research that has been done on the effectiveness of meditation. It is challenging to measure as there are so many schools of thinking that espouse different methods. However, one common factor was looked at in an extensive literature review (Zaccaro), which was slow breathing. A respiratory rate of < 6 breaths per minute (bpm) and < 10 bpm was consistently correlated with stimulation of the parasympathetic nervous system, which also decreases inflammatory cytokines. Whether you paid attention to your breath or not, was not a factor. There is some suggestion that breathing through your nose during either inspiration or expiration could be of some benefit. Note some of the choices mentioned above under meditation.

Other modalities that also incorporate breathing and calm down your nervous system include biofeedback, martial arts, and medical hypnosis.

THE WEIGHT ROOM

Strength training is a major factor in reducing pain and improving your sense of well-being. This would be expected to elevate your levels of Anti-I cytokines. I think there are several reasons. First, there is the obvious benefit of having more strength, so a smaller percentage of your energy is spent on daily activities. You are more able to stay away from the pain threshold.

Second, you have more capacity to engage in vigorous physical activities that are enjoyable and relaxing. Actively placing your attention on these neurological circuits stimulates neuroplasticity in a desirable direction. Many of these activities can be shared with other people. Social isolation is over 50% in the US (Cigna) and spending quality time with others is part of staying healthy.

Third, although it's not going to be at the level of the long-distance runner, there is some degree of endorphin response with strength training. (**Endorphins** and **enkephalins** are the body's natural pain killers.)

Finally, I feel the most important contribution that strength training adds is a reprogramming function. You are now sending a different set of signals from the body parts that are normally firing pain impulses to the brain. As you are voluntarily stressing a given muscle group, you have control as to the intensity of the signals. Somehow the combination of control and different inputs has a significant impact on pain.

I recommended that all my patients (and their spouses) work out with weights in the gym three to five hours per week, indefinitely. Many people roll their eyes. You can choose not to work out but know that it will be difficult if not impossible to recover from your pain if you're out of shape.

It's been shown that people over forty-five receive a tremendous benefit from weight training. We all lose a certain percentage of muscle mass every year (estimated to be about one percent), so resistance training becomes more important as we age. With weight training, you not only prevent the loss, you can also significantly improve your strength. This is the reason I ask the whole family to participate in the resistance training. Since lifespans are more than thirty years longer in the twentieth century than in earlier eras, it means each of us will lose 30 to 50 percent more of our strength. (CDC) This is preventable with consistent training.

Regarding the workout program, essentially all of the machines are safe. Avoid the free weights, as there is more the risk. You should begin with using light weights and high repetitions of fifteen to twenty per muscle group. You can work opposing muscle groups. Avoid unsupported bending at your waist no matter what the situation. Supported bending is fine and so is twisting.

Most health clubs offer at least one free personal training session to get you set up and to make sure you are safe. Many physical therapists will help transition their patients from the specific/functional exercise phase into a long-term conditioning program.

I prefer weight training to be done outside of the patient's home. Few people will consistently work out at home. It's helpful to be in an environment where others are working out hard; also, the equipment is better. Pilates is also excellent in that it emphasizes core strength, and I think yoga can be helpful if the extreme postures are avoided.

SECTION 8 - STAY ON TOP OF YOUR MEDICAL PROBLEMS

Over half of patients don't comply with their doctor's orders. That includes taking important medications. You will simply in better shape if you:

- Closely monitor and control your diabetes
- Take your cardiopulmonary medication
- Control your blood pressure
- Consider a medication review to see if the regime can be simplified. It is a core principle to minimize the number of medications you are taking. It seems more common over the last decade to see patients on long lists of medications. The number of potential side effects from the drugs is problematic, as well as the adverse interactions.
 - This must be done under the careful supervision of your physicians. Begin with your primary care physician.
 - Wean off of opioids, if possible. They are stress response chemicals and are inflammatory. Lowering these meds would help decrease Pro-I cytokines.

SECTION 9 - ADDRESS FAMILY ISSUES

Humans have thrived by their ability to communicate and cooperate. There is a distinct evolutionary vantage to belonging to a “tribe,” both emotionally and physically. The deeper the connection, the better. However, the stronger the bonds, the worse the emotional triggers.

Intellectually, we know better. Why would you want to inflict trauma on those closest to us, whom we care about the most? Yet, the lifetime incidence of physical domestic violence is about 30% for both men and women (Breiding). Survival reactions are powerful and not subject to rational control. Understanding that these automatic behaviors are a result of “neurological trickery” is an important first step in dealing with them.

NEUROLOGICAL TRICKS

Thought suppression: When you try to avoid thinking about something, you not only think about it more, you think about it a *lot* more (Wegner). In an intimate relationship, there are undoubtedly many things you admire about your partner, especially early on. The few traits that you find less than ideal are minor overall, so you ignore (suppress) them. They are no big deal—until you encounter them over and over, and the suppression over time creates a monster in your brain. After a few years a simple irritation becomes intolerable and you often react irrationally. Of course, the good traits are still there—maybe even have gotten better; but your irrational response to the not-so-great ones becomes overwhelming. “Talking it out” doesn’t help because you can’t access the source of your behavior—the unconscious brain. In spite of an abundantly joyful shared life, the relationship frequently blows up because of this unconscious automatic response to suppressed emotions.

Mirror neurons: Your mood will stimulate a similar part of another person’s brain, which subsequently “mirrors” your mood. For example, yawning and laughing will cause others to do the same.

Reactive patterns: Learned and carried with you from your family of origin, they continue to play out in the new family you establish as an adult. Your strongest triggers lie in your household.

Anger: Impedes awareness, which is the foundation of any relationship.

The need to belong: Humans are social creatures. The drive to belong and connect with others is almost as strong as the need for food and water. This need explains why people will put up with negative group situations and why they stay in abusive relationships.

ADDRESSING FAMILY PAIN

I encourage you to make a focused effort to create a haven of safety within your home. The home is a powerful healing force but is equally strong in holding people back.

A “trigger” is a stimulus or situation that resembles a past unpleasant experience and prompts you to react. Any time you are anxious or frustrated, you have been triggered. Even though your family of origin patterned your choices for negotiating through life, your triggers will transfer to your new family, where they will play out, in spite of your best intentions.

Powerful triggers must be addressed if family members are to feel safe. Since reactions to triggers are automatic and unconscious, you can't "talk through them." Here are few suggestions, but please pursue every resource you can think of, to make your home a place of peace and joy.

THE FAMILY RULES OF ANGER

1. When you're upset, disengage.
 - No relationship is improved by angry interactions—*ever!*
 - Stop and take your own "time out."
 - Have a family meeting and ask your children and spouse/significant other what it's like to be around you when you are angry. (The answers typically aren't pleasant.)
 - *All arguments must be taken outside.* Make the confines of your home a safe space. If you can't count on relaxing and regenerating at home, where can you?
2. Apologies later don't make up for damage done earlier.
3. Imagine that you are your child watching you returning home after you have just had an argument with your boss. Would you, as the child, be excited or full of dread?
4. How attractive is your partner when he or she is angry? Compare that to when they are smiling. How attractive do you think you look when you are upset?
5. Listen—only listen—for at least a month.
 - Do not give advice to your children or partner for at least a month—preferably indefinitely.
 - Advice should be given only when asked for.
 - Do not criticize. You will simply be projecting your own self-judgements onto someone else.
6. Your opinion of your children's values is not helpful. They are only children. Making them feel safe should always be your primary concern.
 - Find out who your children really are. They are more interesting than you think.
 - Read the classic book *Parent Effectiveness Training* by Thomas Gordon. It is one of the most powerful and helpful books on parenting you'll encounter.
7. Commit to being a source of inspiration and joy to your family. Watch your family dynamic change in weeks.

It doesn't take months or years to experience the payback from these guidelines. With engagement, you will see a significant impact within a few weeks. It doesn't require that the whole household be involved (although it helps); even *one* person committing to the guidelines can make a big impact. Helping your family create structure around reactions and conflict creates the safe space for them—and you—to thrive.

SECTION 10 - PLAY

Studies show that cultivating optimism, having a sense of purpose, and feeling hopeful causes a reduction in pain and an improvement in mood and function (Hausmann). One paper had participants visualizing their “best self” for five minutes a day over a course of two weeks. They all experienced feeling significantly better (Meevissen). Your brain will develop where you place your attention.

All mammals play, as part of their maturation process. As our brains grow, play factors prominently in language and consciousness development. Even if it seems they are deeply buried, your “play” circuits are still there, waiting to be accessed (Brown). What brings you joy?

PLAY TIME

1. People

Dr. Louis Cozolino wrote an exhaustive review in his book, *The Neuroscience of Human Relationships* (Cozolino) where he points out that humans evolved by interacting with other humans. Therefore, the consequences of becoming isolated are consistent and often severe. Studies out of Australia have shown that there are damaging mental health effects when workers become disabled and out of the workflow of the day. Sitting around the house without a sense of purpose is not a great way to thrive (Waddell).

So, make the effort to connect with fun and safe people. Be part of “tribe” that accepts you fully as you are. Remember, this also means not discussing your pain or complaining. Focus on enjoying yourself and the other person. Currently at the moment, it will have to be done with social distancing in mind.

2. Places

Be thoughtful about choosing different experiences that soothe your nervous system by engaging your five senses. Being out in nature is healing but you can choose to be mindful in your own home.

3. Things

Engage in activities that bring you fully to the present moment, a.k.a., “the flow.” When we engage in something that you find enjoyable and are passionate about, time flies by. When we enter this state of “flow” we get to rest our nervous system and start to release our stress hormones. This is a great way to bring back balance back and to reset your nervous system. It stimulates the vagus nerve, which soothes your nervous system.

You can also always make a choice. For example, elect to enjoy your time at work versus being constantly agitated by all the things that are wrong. Obstacles can become, “challenges” and a chance to demonstrate and sharpen your skill set.

Play isn’t just a way to distract yourself from anxiety. You can’t outrun your mind. Rather, it is mindset of curiosity, deep gratitude, listening, awareness, and improving your skills to calm your nervous system. The result is a sense of contentment and peace. It is a powerful and rapid way to optimize your health.

*"This is the real secret of life -
to be completely engaged with what you are doing
in the here and now.
And instead of calling it work,
realize it is play."
~Alan W. Watts*

LIFE IS TOUGH

It is easy to drop into living life in a survival mode. Life is tough, competitive and challenging. For animals without consciousness, it is far more simple. You either learn the skill and cunning to survive—or not. There is also a lot of luck. Humans have the additional characteristics of language, socialization and can deal in the abstract. One of the curses of consciousness, is that the one thing we know is that we are not going to live forever. It is the ultimate fear. Yet we spend a lot of time distracting ourselves and trying not to think about it.

THE PARADOX

Here is the paradox. The more anxious and frustrated you are, for any reason, you are adding to your threat load and there is a much higher chance that you will develop a severe disabling disease and die earlier. Additionally, while living in this state, your capacity to enjoy the time you have been given on this earth is compromised. You are living a chaotic and reactionary life and even forgetten to ask yourself, “where is the endpoint?” There is none.

Instead of surviving and hoping to thrive someday, it is necessary to flip the paradigm. Thriving is a learned skill similar to learning a new language. Once you have learned it, your odds of surviving improve, regardless of the circumstances—including COVID-19. Thrive and survive.

REFERENCES

Coughlin, Steven. Anxiety and depression: Linkages with viral diseases. *Public Health Reviews* (2012); 34: 1-13.

Fredheim OM et al. Chronic non-malignant pain patients report as poor health-related quality of life as palliative cancer patients. *Acta Anaesthesiologica Scandinavica* (2008); 52: 143 – 150.

Porges, Stephen. *The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication, Self-regulation*. Norton and Co. New York, NY, 2011.

Simmons WK, et al. Appetite changes reveal depression subgroups with distinct endocrine, metabolic, and immune states. *Molecular Psychiatry* (2018); <https://doi.org/10.1038/s41380-018-0093-6>.

ANXIETY

Cigna US Loneliness Index 2018. Published by Cigna

Cohen S, et al. Psychological Stress and Disease *JAMA* (2007); 298:1685-1687.

Eisenberger N. The neural bases of social pain: Evidence for shared representations with physical pain. *Psychosom Med* (2012); 74: 126-135.

Papagianni, E., & Stevenson, C. Cannabinoid regulation of fear and anxiety: An update. *Current Psychiatry Reports* (2019) 21: 38. [https://doi: 10.1007/s11920-019-1026-z](https://doi.org/10.1007/s11920-019-1026-z)

Rahe R, et al. Social stress and illness onset. *J Psychosomatic Research* (1964); 8: 35.

Schubiner, Howard. *Unlearn Your Pain, 3rd edition*. Mind Body Publishing, Pleasant Ridge, MI, 2016.

Seminowicz DA, et al. Effective treatment of chronic low back pain in humans reverses abnormal brain anatomy and function. *The Journal of Neuroscience* (2011); 31: 7540-7550.

Song H, et al. Association of stress-related disorders with subsequent autoimmune disease. *JAMA* (2018); 319: 2388-2400.

SLEEP

Agmon M and Galit Armon. Increased insomnia symptoms predict the onset of back pain among employed adults. *PLOS One* (2014); 9: 1-7.

EXPRESSIVE WRITING

Baike KA and Kay Wilhelm. Emotional and physical health benefits of expressive writing. *Advances in Psychiatric Treatment* (2005); 11:338-346.

Burns D. *Feeling Good*. Avon Books, New York, 1999.

Pennebaker, James and Joshua Smyth. *Opening Up and Writing it Down: How Expressive Writing Improves Health and Eases Emotional Pain*. The Guilford Press, New York, NY, 2016.

Petrie K, et al. Effect of Written Emotional Expression on Immune Function in Patients With Human Immunodeficiency Virus Infection: A Randomized Trial. *Psychosomatic Medicine* (2004); 66: 272-275. doi: 10.1097/01.psy.0000116782.49850.d3

Wegener DM, et al. Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology* (1987); 53: 5-13.

FORGIVENESS

Carson JW, et al. Forgiveness and Chronic Low Back Pain: A Preliminary Study Examining the Relationship of Forgiveness to Pain, Anger, and Psychological Distress. *The Journal of Pain* (2005); 6: pp 84-91.

Copeland W, et al. Childhood bullying involvement predicts low-grade systemic inflammation into adulthood. *PNAS* (2014); 111: 7570-7575.

Luskin, Fred. *Forgive for Good*. Harper Collins, New York, NY, 2003.

Takahashi A, et al. Aggression, social Stress, and the immune System in humans and animal models. *Frontiers in Behav Neuroscience* (2018); 12: 1-16.

NUTRITION

de Cabo, Rafeal and Mark Mattson. Effects of intermittent fasting on health, aging, and disease. *NEJM* (2019); 381: 2451-2451.

Daneshkhah A, et al. The possible role of vitamin D in suppressing cytokine storm and associated mortality in COVID-19 patients. *MedRxiv* (2020); <https://doi.org/10.1101/2020.04.08.20058578>

DECREASE YOUR NERVOUS SYSTEM STIMULATION

Berk LS, et al. The neuroendocrine and stress hormone changes during mirthful laughter. *Am J Med Sci* (1989); 6:390–396.

Kok BE, et al. How positive emotions build physical health: perceived positive social connections account for the upward spiral between positive emotions and vagal tone [published correction appears in *Psychol Sci* (2016); 27: 931]. *Psychol Sci* (2013); 24: 1123 - 1132. doi:10.1177/0956797612470827.

Mäkinen TM, et al. Autonomic nervous function during whole-body cold exposure before and after cold acclimation. *Aviat Space Environ Med*.

Mason H, et al. Cardiovascular and respiratory effect of yogic slow breathing in the yoga beginner: what is the best approach? *Evid Based Complement Alternat Med* (2013); 2013:743504. doi:10.1155/2013/743504.

Miller M, et al. Positive emotions and the endothelium: Does joyful music improve vascular health? *Circulation* (2008); 118: S1148

Vickhoff, B, et al. Music structure determines heart rate variability of singers. *Frontiers in psychology* (2013); 4: 334. 10.3389/fpsyg.2013.00334.

Zaccaro A, et al. How breath control can change your life: A systematic review on psycho-physiological correlates of slow breathing. *Frontiers of Neuroscience* (2018); 12: 1-16.

PHYSICAL INTERVENTIONS

Centers for Disease Control and Prevention. “Trends in aging – United States and worldwide.” *MMWR* (2003); 52: 101-104.

Cigna US Loneliness Index 2018. Published by Cigna

FAMILY

Breiding MJ, et al. Prevalence and characteristics of sexual violence, stalking, and intimate partner violence victimization. National Intimate Partner and Sexual Violence Survey, United States, (2011); Morbidity and mortality weekly report. Surveillance summaries. (2014).

Gordon, Thomas. *Parent Effectiveness Training*. Three Rivers Press, CA, 2008 edition (first published 1972)

Wegner DM, et al. Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology* (1987); 53: 5-13.

PLAY

Berk LS, et al. The neuroendocrine and stress hormone changes during mirthful laughter. *Am J Med Sci* (1989); 6: 390–396.

Brown, Stuart and Christopher Vaughan. *Play: How it Shapes the Brain, Opens the Imagination, and Invigorates the Soul*. Penguin Group, New York, NY, 2009.

Hausmann, LRM, et al. Reduction of bodily pain in response to an online positive activities intervention. *Jrn of Pain* (2014); 15: 560-567.

Cozolino, Louis. *The Neuroscience of Human Relationships*. Norton and Co. New York, NY, 2014

Kok BE, et al. How positive emotions build physical health: perceived positive social connections account for the upward spiral between positive emotions and vagal tone [published correction appears in *Psychol Sci* (2016); 27: 931]. *Psychol Sci* (2013); 24: 1123–1132. doi:10.1177/0956797612470827.

Meevissen, YMC, et al. Become more optimistic by imagining a best possible self: Effects of a two week intervention. *Jrn of Behavior Therapy and Experimental Psychiatry* (2011); 42: 371-378.

Miller M, et al. Positive emotions and the endothelium: Does joyful music improve vascular health? *Circulation* (2008); 118: S1148.

Seminowicz, David A., et al. Effective Treatment of Chronic Low Back Pain in Humans Reverses Abnormal Brain Anatomy and Function. *The Journal of Neuroscience* (2011); 31: 7540-7550.

Waddell, G and Kim Burton. *Is Work Good for Your Health and Well-Being?* TSO. London, England, 2006.



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