



The Benefits of Exercise

It has taken me years to become an avid exerciser. I remember all the fits and starts of new work-out routines, the numerous attempts that went nowhere, and the gym memberships that were wasted because I hadn't really bought into the benefits of exercise. I remember feeling that exercise just took too much time and effort, and I hated getting sweaty. As a physician, I have always been well-aware of the importance of exercise – all of the ways that it improves health - but until I fully wrapped my head around being a devoted exerciser I never truly understood how it affects us on so many levels.

It took me a good two years of solid goal setting (and a lot of personal brain-washing) to become an avid exerciser, and what put me over the edge was a specialized test that I often do for patients and did for myself (called a urine amino acid test) that showed I had very early insulin resistance

on a cellular level – the forerunner to diabetes – even before my blood sugars were high.

Now that I am an exercise devotee, I am experiencing first-hand how exercise is not just for the body, but really does help the mind and the soul. Now I am witness to the fact that that if I don't exercise my body actually aches more. When I don't exercise my body becomes stiff, my mood is

lower, and I feel old. Without exercise I can feel my metabolism slow down, and I feel sluggish and dull both mentally and physically. But when I do exercise, everything feels better. My body has more mobility, more energy, and I have more, well, sparkle.

The list of how exercise positively affects the body is seemingly endless.

Exercise reduces the risk of chronic diseases such as diabetes, cancer, hypertension, and heart disease. It improves cholesterol panels by increasing good cholesterol and lowering both bad cholesterol and triglycerides. Exercise reduces insulin resistance and increases how much sugar the cells take up thereby reducing blood levels of sugar. Exercise builds bone, reduces inflammation, and improves brain function. That's right, not only does exercise help with mood, it also improves memory. Finally (and I am certain that I have missed some positive benefit in this list), exercise improves sleep.

The most fascinating part of all of this for me is that exercise does all of these

wonderful things by stressing out the body. That's right – exercise is a stress on the body, but one that makes the body work better.

You know the song – “If it doesn't kill you it makes you stronger.” Well, lifting weights, for example, causes microscopic tears to the muscle fibers. It is in the repair of these tears that more muscle is built, thus leading to larger muscles.

With regards to inflammation, exercise is an oxidative stress, meaning that exercise actually causes inflammation because it is damaging muscle. However, by being repeatedly exposed to small bouts of increased damage and inflammation, the body learns to handle oxidative stress better and turn down these pathways of inflammation.

In addition, in response to the stress caused by exercise, the body is stimulated to release endorphins. Endorphins are lovely little molecules in the body that both improve mood and help the immune system function better. The end overall result is that



exercise actually reduces inflammation.

The same thing is true with the metabolic capacity of our cells. Exercise causes a marked increase in the demand for oxygen and other nutrients by the cells of the body. This increased demand initially is a stress to the body, but after continued exercise, the mitochondria inside of the cells become more efficient at taking up oxygen and glucose and turning them into molecules of energy. In fact, to meet the increase in metabolic demand that exercise places on the body, exercise stimulates the formation of new mitochondria so that the cells of the body can handle the increased metabolic demand that regular exercise induces.

This translates to the entire system becomes more efficient – the heart becomes better and beating, the arteries become more dilated to improve circulation of blood and nutrients, and the lungs become better at taking up oxygen and releasing carbon dioxide. The bottom line is that exercise makes the entire body work better.

You can see how all of this improves health outcomes. By reducing inflammation, exercise reduces the risk of all of the major diseases. By improving cardiac function, exercise reduces the risk of heart disease. Causing the arteries to dilate more, reduces high blood pressure. Of course, exercise reduces diabetes through burning sugar, reducing fat stores,

increasing lean muscle, and reducing inflammation.

Exercise helps with mood through a few mechanisms.

The increased production of endorphins helps with mood, but exercise also increases the levels of several of our neurotransmitters including serotonin, dopamine, norepinephrine, and GABA.

Serotonin is the neurotransmitter that helps us feel joy. Dopamine helps us with focus, motivation, and drive. Norepinephrine helps us feel that we are on top of the world and can handle anything, and GABA helps us feel like life is all okay. Because serotonin is the precursor to melatonin, which is our hormone of sleep and repair, exercise also helps with sleep.

Not only does exercise improve mood and sleep, it improves brain function as well by increasing the amount of brain-derived neurotropic factor (BDNF). This is a major molecule in brain function because it helps support the function of both the central (brain) and peripheral (body) nervous systems,

encourages the growth of new synapses, and improves long-term memory.

Can you imagine if we had a drug that reduced inflammation, reduced the risk of most major diseases including heart disease and cancer, improved mood and sleep, and improved brain function? Wow. That drug would be a blockbuster, and everyone would be on it!

As a matter of fact, several studies have shown that



exercise reduces depression more effectively than drugs, and that exercise in combination with diet reduces the risk of diabetes better than drugs!

Let me take it even one step further and let you know that exercise actually prolongs our life span. A

study in *Prevention Magazine* reported that people who exercise vigorously had a life-expectancy that was nine years longer compared to people who were sedentary. This is thought to be due to the fact that exercise actually increases telomere length.

Remember telomeres?

They are the little caps on the ends of our DNA that get worn down every time a

cell replicates. After so many replications the telomeres become too short and this is the signal to the cell that its life is over. When telomeres become too short our cells die. It turns out that exercise increases nuclear respiratory factor 1 (NRF1), which is protective to the

ends of the telomeres. By reducing the rate at which the telomeres are worn down, exercise prolongs the life of our cells, hence prolonging our life.

How much exercise is enough?

It depends on what you are looking for. There are numerous studies showing that any exercise is better than none at all as far as improving mood and reducing the risk of disease. However, in order to improve lifespan, the *Prevention Magazine* study showed that it was the participants who performed vigorous exercise that gained nine years of life. In the study, vigorous exercise was the equivalent of jogging 30-40 minutes 5 days per week, or 150-200 minutes per week of vigorous exercise, or longer of less vigorous exercise.

I am routinely questioned by patients who want to know how they can reduce their risk of cancer, increase their chances of having an excellent quality of life until they die, and how they can live longer. From now on, the first thing I am going to recommend, even before supplements, is exercise!

What kind of exercise should we be doing?

Here is where I used to barter with myself in the days before I was an avid exerciser. I would tell myself that I could just lift weights and that would be enough. Or maybe just walking would do it. In my heart-of-hearts I knew I had to do more than that, but it just seemed too overwhelming!

Now I realize that to gain the full benefits of exercise, one must regularly engage in all four areas of exercise – endurance, strength, flexibility and stretching. Perhaps not every day, but within the course of a week we should spend time doing all four areas. This not only keeps us healthier and more mobile, but it reduces the risk of injury and keeps exercise more interesting. Of course, there are cross-overs between the four areas. For example, building strength also helps with balance, and cardiac

endurance helps with strength, but it is important not to forgo any one area.

Endurance exercise is otherwise known as “cardio” in the exercise world. These are exercises that increase your breathing and heart rate such as jogging, dancing, and brisk walking. Endurance exercise increase metabolism, burns calories, and is the driving force behind the improvements in the cardiovascular system seen with exercise.

If you really want to go for it, plyometrics are the more intense version of cardio.

Plyometrics involve pretty much any kind of jump training in short, intense bursts to increase endurance, strength, and speed.

One form of plyometrics, call High-Intensity Interval Training (HIIT), is currently

felt to be the most effective way to increase metabolic rate. HIIT training involves short, twenty second bursts of maximum effort followed by a shorter, ten second period of rest. For example, twenty seconds of running

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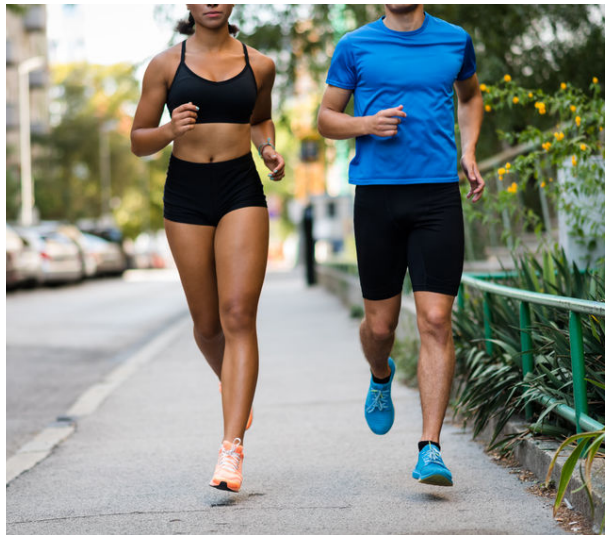
at top speed, or jumping jacks as fast as you can, followed by ten seconds of slow jog for recovery.

HIIT training has been shown to increase the ability of cells to take up and utilize oxygen (VO₂ max) more quickly than conventional exercise and therefore is wonderful for improving athletic performance and increasing metabolism. However, it is not as good at reducing obesity and helping with cholesterol panels. For the average person, 30-50 minutes of endurance (cardio) exercise three times weekly is recommended.

Strength exercise is just what it sounds like – building muscle to improve strength. Building muscle increases metabolism but it also builds bone, and building bone actually helps maintain cognitive function.

A study in *The Journal of Alzheimer's Disease* in 2010 showed that bone loss was correlated with a higher risk of early Alzheimer's disease. It seems that reduced bone mineral density was in part responsible for early brain atrophy and memory decline.

Speaking of bone loss, another area of concern for the elderly is fractures. Hip and spine fractures are a huge health problem among older folks because fifty percent of people who fracture their hip after the age of sixty never return to their homes, and thirty percent end up dying within one year of their fracture. There is motivation to exercise!



Strength exercises include lifting weights, using a resistance band, or using your own body weight to improve strength, such as squats and planks. When engaging in strength training, it is important to rotate through all of the muscle groups over the course of the week. Perhaps focusing on upper body one day, another day lower body, and yet a third

day a little of both. Strength training can be just twenty minutes tagged on to the end of a cardio workout.

Balance exercises work to improve both the muscles and nerves needed to maintain balance along with the integration of the two systems. We need to have strong muscles to support the body, but we also need to know positionally where

we are in space. The central and peripheral nervous systems must send and receive input to and from the muscles to even know

that we are standing upright, much less standing on one foot. Balance is my ultimate nemesis! But given that both my mother and my sister have fallen and fractured their legs, it is an area that I work on diligently!

I think that balance is one of the harder skills to maintain just through the activities of daily living. Think about it – walking and stairs involve only forward and back motions, which means they only strengthen the main front and back muscles of the legs such as the calf muscles and

quadriceps muscles. Balance requires all of the little muscles in the legs and feet in addition to the muscles of the abdomen and back.

Balance also requires a healthy nervous system.

One of the biggest hazards to our nervous system are environmental toxins such as lead and mercury.

Therefore, aside from exercises that increase balance such as standing on one foot, heel-toe walking, yoga, and tai chi, working on detoxification with a metabolic medicine provider will improve balance.

Finally, there is *flexibility exercise*. Flexibility is so

important to maintain throughout life because when we are not flexible our freedom of movement in day-to-day living

becomes less. With less range of motion and freedom in movement we start to limit our activities, which then decreases strength, slows down metabolism, and increases the risk of injury.

As we age the body tends to lose collagen

all over (think wrinkled skin), which decreases the water content in the tissues. When this happens in tendons it leads to less elasticity and fluidity in tendons, which we feel as stiffness.

Aside from stiffness in tendons, we can also experience stiffness and reduced range of motion in joints as we age, especially if we are not active. Think about how much we sit all day! Stretching to maintain flexibility in muscles, tendons, and joints is essential to healthy aging. Nothing makes one feel old more than stiffness!

Most people are aware of stretching lower muscle

groups such as the quadriceps or hamstrings, but it is important to stretch all muscle groups (i.e.: I want to be able to wipe my bum when I am old!), so finding an inclusive stretching routine is important.

I am a huge fan of yoga of all kinds to improve flexibility. A good yoga routine will stretch all muscle groups while working on balance and strength as well. Although I haven't quite worked up to it, I think twenty minutes of stretching every day with two days of a more thorough routine would be ideal.

As for me (and I think everyone else), exercise is a work in progress. Currently I am exercising four days a week, with an eye toward five. The happy news is that my insulin resistance has reversed and I am stronger than ever. While my weight has gone up quite a bit (because I have built so much new muscle in the past two years) my waistline is down. And I am actively reducing my risk of so many other diseases!

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