

The Path of Least Resistance

Dr. Darin “Dutch” Workman

Recently, I was reading an article in *Discover Magazine* that caught my attention. A physiologist named Giovanni Cavagna has dedicated 40 years to the study of walking. This is a very complex movement that we simply take for granted. He focuses on the motion of the body during this movement.

He was intrigued by the fact that African women can carry enormous loads on their heads (as much as 70 percent of their body weight) for great distances without trouble, while those in other places of the world struggle just to walk (barely being able to carry 15 percent). He began a long-term study to discover why they were able to do this. Through the years, he found that the key to their ability was in the way they walked. Their technique, if you will.

I have heard it said that walking is merely falling forward in a controlled way. This is actually quite accurate. The body leans forward to some degree, and the feet take a step to keep the center of gravity from falling to the ground. The typical person takes a step, converting downward motion into forward motion. In doing so, they plant the foot in resistance of the downward motion, but they actually slow the body down in the process while wasting energy in muscle contraction.

However, the African women walk in a way that pushes the body in forward motion more smoothly and without as much resistance. Most of us lose 35 percent of our energy through this resistance, and African women only lose 20 percent with heavy loads—all by changing the way they use their bodies.

In doing this, they conserve energy, and are able to carry heavier loads for longer periods of time. Simply put: They walk in a way that pursues the path of least resistance.

This concept of taking the path of least resistance is applicable in everything we do. I have dedicated my time to the study of movement and resistance. For years, I have treated patients and taught through articles and workshops how to move the body through the path of least resistance. By doing this, we move with increased strength, coordination, and endurance. I have found that it is also a key factor in reducing injury. Let's discuss how this happens.

Strength: "...the power of exerting or withstanding pressure, stress, force; potency; effectiveness." Anything that gets in the way of what you are trying to accomplish is called resistance. And it takes more strength to do something against resistance as

opposed to without resistance. In addition, moving against resistance wears things out faster.

One example that many understand is driving a car with the parking break on. True story: While on vacation recently, I pulled a rental car over to load some luggage. It became increasingly more obvious to me that the car was dragging, and I was pushing heavier than usual on the gas to get it to move. Finally, my brain figured out that the emergency brake was engaged. When I released it, I was amazed how freely and strongly the car moved. We all had a laugh at my oversight.

I might have sensed it earlier if my mind wasn't occupied with other matters. We do the same thing—overlooking obvious resistances to our movement, because our minds are occupied with something else and/or we are too focused on what we are presently doing.

By spotting the things that resist our natural movement, we disengage parking brakes (if you will) and have greater strength and power.

Coordination: "...balanced and harmonious movement of the body." This concept is the most difficult to explain, because the concept of coordination is little understood. Coordination is the

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ability of the brain to understand and enable the body to do various things.

The mind is much like a maze, with different pathways and dead ends. When trying to learn a new concept or physical movement, you must break down the walls that stand in those pathways, preventing you from progressing. With time and practice, the walls are destroyed, making the path more easy to travel with each repetition.

The same wall may be difficult for some, and easily for others to break through. We each have a different maze with our own walls to break through.

My point is that resistance to normal body movements creates one more obstacle the body must deal with, leaving less energy to break down walls that block our coordination. For that manner, anything that causes resistance, be it physical, mental, emotional, or spiritual, will have a negative effect on our coordination to a given degree.

Physically, the muscles are able to coordinate movements much more readily if they have less fatigue and resistance. Next time you are really tired, notice that your movements are shaky, uncoordinated, and your hand-eye coordination lags.

Endurance: “the capacity to keep going...”

Total energy, minus energy used for each motion, equals the total number of motions possible.

This is a simple equation. By reducing the amount of energy exerted to do each motion, more motions are possible before fatiguing.

Let’s say we have one dollar for buying candy bars. If we spend fifty cents for a candy bar, we can only buy two of them. But if we only have to spend twenty-five cents for a candy bar, we can buy twice as many. Likewise, if we’re spending fifty cents worth of energy to play a passage, we will be able to play twice as long by using half as much energy.

By following the path of least resistance, we can conserve energy when we play, allowing us greater endurance to play longer. The way we sit, the way we move when playing, the size sticks we use, and even how we think all cost energy and affect our total energy storage. Once energy gets low, the body nears fatigue and its movements become sloppy and lazy. This wears the body down, making it more susceptible to injury.

Reduced Injury: Back to driving (something most of us can relate to): My pet peeve is when someone drives by pushing on the gas pedal with one foot, and the brake with their other. They are trying to speed the car up, and at the same time slowing it down. They’re actually fighting against themselves. How many of us are guilty of this when doing various actions—especially playing an instrument. We grip the stick so tightly that while one muscle is trying to push it to the drum, the other is fighting to keep it where it is.

Driving this way wears the brakes down just as bodily movement in this way wears the body down. I have a difficult time seeing why a person would consciously do that, and not change the behavior when it is brought to their attention.

I spend countless hours bringing such behavior to my patients’ attention when they can no longer function because of it. Many of them are musicians like us. I am calling it to your attention now. Stop fighting your own movement, and teach your students to do the same. Figure out how the body is designed to move, and allow it to do so without resistance.

Here’s what happens if you don’t. Because of resistance, the muscles must work harder than usual, they fatigue early on, and the brain continues to drive them to do things in a fatigued state. This breaks down the muscle fibers, causing contraction, and

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spasms. The tightness puts more pressure on the joint, causing it to get hotter from the friction. The heat breaks down the tissues in the joint causing injury and pain.

In addition, the muscle problem causes further resistance to movement, which decreases coordination. This means that the body cannot do what the brain requests. You have all felt the frustration that results. This frustration causes more tension, making it increasingly difficult to play. From there, the cycle continues until the musician is rendered incapable of playing.

I know that it sounds pessimistic and far-fetched, but I see it all of the time—it is a reality.

The Solution: Now that we are totally depressed at the possibility of injury that will inhibit our playing, let's discuss the basics of how to reduce resistance that causes the problem.

First of all, we cannot stop all resistance. That is not possible. The body can operate efficiently with a slight level—it is part of movement itself. The key is to teach musicians to reduce needless resistance, which can only be done by each individual, and HERE'S HOW:

1. BE TAUGHT PROPERLY. There are some great teachers who can save us a lot of this pain and money (yes, money). They protect us from injury and from going back to relearn what you missed along the path of playing.

2. LEARN TO LISTEN TO THE BODY. This is an ongoing process. Every time we play, the body tells us what it needs—every time. It is speaking when we feel awkward, and rusty. It is YELLING at us when

we feel PAIN. Teach students to listen carefully, and change the movements it tells them to.

3. WATCH YOURSELF, AND MAKE CHANGES. Whether by use of a mirror, video, or other method, we should analyze our playing, then make suggestions to ourselves as we would to anyone else we were watching. Try writing them down.

4. FIND MUSICIANS THAT DON'T HURT. Observe the musicians that don't have problems—those that look relaxed and smooth when they play. We are doing something different than them—we should find out what it is, and mimic them.

We should never be too proud to change the things that stand in the way of our improvement as a musician (or any other area for that matter). Choosing the path of least resistance is a developed ability. By being aware of how our body feels while moving, we can sense resistance to a movement. This should be our concern in every body movement, and all thoughts of the brain.

I realize that few will actually take things from this article and instill them in their lives. But, if it is worth the time to read, then perhaps it will be important enough to try taking the path of least resistance.

I love treating musicians' injuries, but I would much rather have a person avoid them in the first place.

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