Fascial Recoil

Wiley Patterson, MD, Certified Advanced Rolfer®,
and Rolf Movement® Practitioner

Wiley Patterson

ABSTRACT *This article discusses some basic mechanical properties of fascia, including its elastic properties and their significance to structural integration gleaned from the 2016 Fascia Research Summer School held in Leipzig, Germany.*

International Fascia Conference

A Fascia Research Summer School (FRSS) was held in Leipzig, Germany, in September 2016, with Robert Schleip, PhD, and Thomas Findley, MD, instrumental in organizing these ongoing conferences. Schleip has been a Rolfer for decades and earned a PhD in human biology where he focused on fascial studies, and he has become a potent voice and liaison for Rolfing® Structural Integration's (SI) interaction with mainstream lines of fascial inquiry. Findley was a world-class leader of fascial research and academic communities who have amplified and validated the clinical work of Rolfing SI for decades. As a result of their work, more and more fascial research articles written each year. This particular conference attracted presenters and attendees from dozens of countries. Besides Rolfing SI practitioners, professionals from physical rehabilitation, pain management, orthopedics, athletic performance, massage, anatomy, acupuncture, and histological fascial research were well represented. Some of the notable structural integration presenters included Tom Meyers, former Rolfer and the developer Kinesis Myofascial Integration of structural bodywork from Maine; Fernando Bertolucci, MD, physician and Rolfer from Brazil; and the aforementioned Robert Schleip, PhD, Rolfer, and Feldenkrais® practitioner from Germany.

Personally, I had two favorite presentations: Gunnar Spohr, DO, MD, who presented fascial recoil in his presentation titled "The heart as a fascial organ" and Bertolucci's "Tensegrity touch." The ideas about facial recoil intrigued me greatly and this article is devoted to summarizing some of the main points Spohr presented at the conference. I want to mention to you, the SI community, "Tensegrity touch" was quite pertinent to my Rolfing practice and I was able to immediately put Bertolucci's presented suggestions into action. I had never viewed working with the 'sleeve' of the body in this way before. He keeps his attention and intervention in the superficial fascia and truly profound changes occur. This topic will not be covered in this article, though I highly recommend his training on this technique. As I mentioned, this discussion is inspired by Spohr and his presentation "The heart as a fascial organ."

Fascial Elasticity

Elasticity is the ability of a material to regain its original shape after distortion. Another common use of the word elastic is 'stretchiness' as in the stretchy band of one's underwear. However, the first definition is of more importance to this discussion regarding the biophysics of fascia. Imagine three spheres of equal dimension, one made of marshmallow, one of rubber, and the last one of stainless steel. Drop each sphere onto the hard, level surface of a steel anvil and observe how high each sphere bounces. The marshmallow will splat and barely bounce. The rubber ball will bounce quite a bit, but the stainless-steel ball will bounce highest. It has the greatest capacity to regain its original shape. The energy imparted into the marshmallow ball is lost on impact, spread throughout the weak internal organization. The stainless-steel ball has a much higher level of molecular crystalline (not glass) organization and has better resistance to chaotic, disorganized transfer of energy. The potential energy converting to kinetic energy on impact is conserved best by the stainless-steel ball by not changing the shape of the object, the energy of the impact is sent through the stainless-steel ball with minimal distortion of its shape and the ball is lifted highest away from the anvil.

Most of us have seen slow-motion videos of a golf ball being compressed and regaining its shape after the golf club head impact. It is this force that is involved in regaining its original shape that imparts much of the eventual distance. If you hit a marshmallow with the same force and speed, the distance it travels is minimal. This reminds me of a video I saw of the tibial distortion of a gymnast landing from a vault. The bone looks as if it will certainly explode from the marked distortion, but it doesn't, and the gymnast bounces upward as the stored force normalizes. Imagine a slingshot. As one pulls the sling back, stretching the elastic bands, potential energy is imparted into and stored in the elastics (see Figure 1). It does not matter how fast nor how slowly the elastics are stretched, only how far. The force imparted into the dimension of the distortion from its original shape determines the amount of energy stored into the sling shot. As the sling is released and the elastics shorten, the projectile is hurled forward. Its speed and distance depend on the ratio of the potential energy stored in the elastics relative to the projectile's mass. A BB will fly farther than a golf ball given equal pulls from the same slingshot.

The working unit of a skeletal muscle, a sarcomere, is composed of actin-myosin myofilaments. During contraction, the myosin 'ratchets' the actin inward, the sarcomere shortens and pulls its Z-lines toward each other, thereby shortening the sarcomere. The attached bone, via the tendon, will be moved. However, by pre-stretching a muscle-tendon-fascial plane arrangement, more force can be generated than by mere muscle contraction alone. It is estimated that elastic recoil can add as much as 40% to the inherent muscular force of any movement.

Fascia is highly elastic and this property defines much of its function. Healthy fascia resists stretching and tends to regain its original shape. For example, the coach of a gold-medal sprinter at the Rio de Janeiro Olympics, in his "Teach Me to Run" video course, emphasizes the need to dorsiflex the ankle and toes on each stride. This lengthens the plantar fascia and Achilles tendon, stretching them and increasing potential energy. I tested the idea. Walking on a sidewalk, I noticed a stranger ahead of me, walking at the same speed. I neither gained nor lost ground as we walked. I then decided to gently but completely dorsiflex my toes and ankles with each forward swing of my calves. I very quickly passed the person. I felt the stretch-generated tension and the extra force available as I pushed off. My stride lengthened from the extra force without a conscious effort to lengthen my stride nor to work harder. The same coach also asks his sprinters to raise their knees high during each forward stride, stretching the gluteal and hamstring fascia. So, if you experiment with high knees, dorsiflexed ankles, and dorsiflexed toes while sprinting, you will feel this effect on your fascia and subsequent increase in speed.

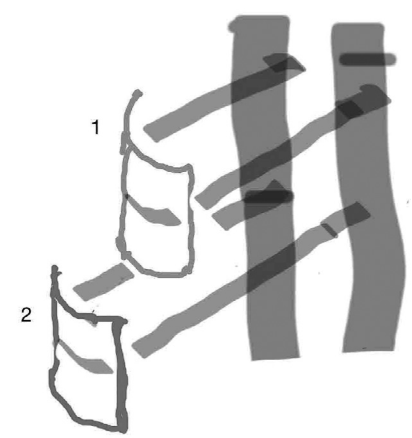

Figure 1: Slingshot in both slack position (1) and activated position (2), ready to fire once activated.

Fascial Recoil in the Heart and Blood Vessels

Another fascinating example is the concept of fascial recoil in cardiac and vascular function. In Figure 2, you will notice that all four heart valves are

Fascia is highly elastic and this property defines much of its function. Healthy fascia resists stretching and tends to regain its original shape.

Fascial recoil is a basic principle in the functional nature of fascia and is highly involved in the conservation of energy in the continuity of movement, but also in the basic function of rhythmic movements such as peristalsis, breathing, and craniosacral rhythms.

close to each other and lie mostly on the same plane. Let us consider just the left ventricle, the aortic valve, and the ascending aorta. As systole occurs, the left ventricle contracts and pushes blood through the aortic valve into the ascending aorta. As the heart contracts, the valve plane moves downward away from the aortic arch about a centimeter. As the blood from the left ventricle enters the ascending aorta, the circumferential connective-tissue layers comprising the aorta are distended. Both the heart valve plane movement and the aortic widening are fascial distensions and thereby have stored potential energy. As the ventricular contraction ends, the unidirectional aortic valve shuts and then is passively moved back upward to its previous position. As it shuts, and is moved distally, the closed valve face slingshots the left ventricular blood, now in the ascending aorta, further along the aorta. The stretched fascia of the myocardial wall wants to elastically regain its original shape.

The bolus of blood leaving the left ventricle widens the diameter of the aorta which is then subject to another fascial recoil in a self-perpetuating passive peristaltic movement along the course of the artery. So, the left ventricular contraction moves blood out of the left ventricle into the ascending aorta, but that blood needs the fascial recoil inherent in the structure of the arterial system to move it all the way down to the feet. The heart itself has a spiraling fascial organization to help conserve energy. Fascial recoil is part of the motor of the heart. The muscular contractions activate the slingshot-like fascial recoil. The heart works as a dynament (omnidirectional – no origin nor insertion; see Figure 3). Dynament is a term coined by Jaap van der Wal, MD, PhD, which is the idea of architectural units of connection and force transmission in the posture and locomotion system (2020). [See Bertolucci's article, page 56 to 65, for more information about van der Wal's dynament concept.] Therefore, its contractions mainly work on these fascial arrangements. The cardiac muscle of the left ventricle does not pump through the vasculature, instead it primes the aorta (just like the left atrium primes the left ventricle) and activates the fascial recoil of the valve plane and arterial walls.

The following link shows the heart valve plane movement and other systolic distortions:

https://bit.ly/3KS8Lrm

Fascial Recoil in Movement

The contralateral nature of walking is a good example of storing potential energy and releasing it as kinetic energy through fascial recoil. Fascial recoil is a basic principle in the functional nature of fascia and is highly involved in the conservation of energy in the continuity of movement, but also in the basic function of rhythmic movements such as peristalsis, breathing, and craniosacral rhythms. In Figure 4, the stored potential energy visible in this

Figure 2: Diagramatic horizontal section showing the valve plane of the heart (1. bicuspid valve; 2. tricuspid valve; 3. aortic valve; 4. pulmonary valve).

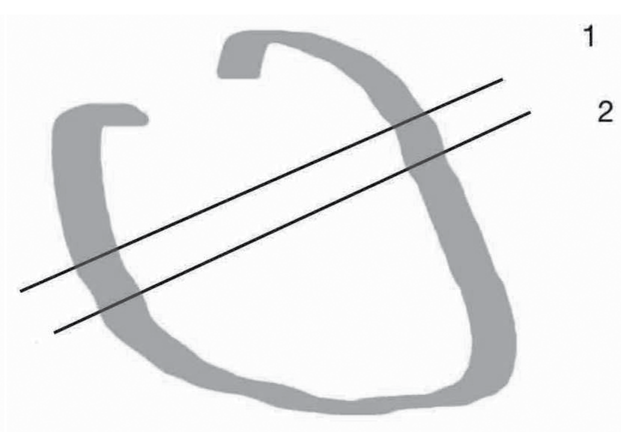

Figure 3: Diagrammatic sagittal section of the fascial architecture of the heart as a dynament (postion 1 is the valve plane during diastole with the plane moving to position 2 during systole).

Figure 4: The stored potential energy is visible in this young hiker's contralateral coordination which is storing potential energy to aid the next step forward. Photo courtesy of the author.

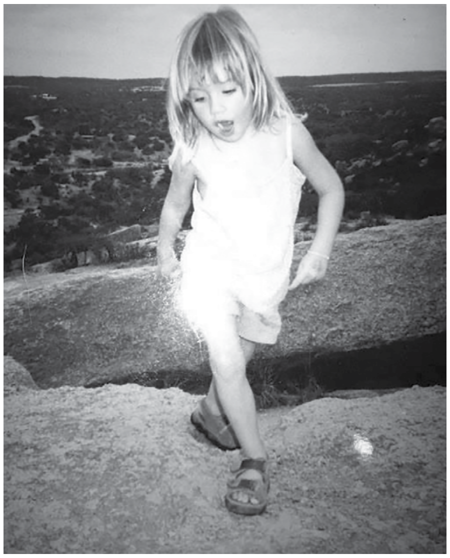

Figure 5: Fascial recoil will allow this dancer to return to an erect posture. Photo courtesy of the author.

young hiker's contralateral coordination is waiting to aid the next forward step. The potential energy is stored in the structure of the fascial system itself and is released as kinetic energy in moving forward.

In Figure 5, the dancer has stored potential energy in the fascia of her rectus abdominis, iliopsoas, and other hip flexors. It is obvious that she cannot stay in this position for long. She will straighten her torso and hips mainly from fascial recoil rather than contraction of the iliopsoas and assisting hip flexors.

This stored potential energy also aids in longevity, as suggested by a study of older men doing hopping training (Hoffren-Mikkola et al. 2015). Over eleven weeks, there were verifiable improvements in strength and balance in this group. This came about due to an increase in fascial recoil. As we age, the physical qualities of our fascia change and we lose some fascial recoil. How many sixty-plus-year-old people do you know who would want to jump down from a four-foot height? At twenty years old, this can easily be done, yet it becomes unappealing or even scary as we reach our senior years. However, fascial recoil can be improved using Wolf's law – connective tissue restructures itself according to the forces acting upon it. So, skipping, jogging, or bouncing on a trampoline will increase the amount of fascial recoil. A slight vibration to the impact on the fascia is necessary to increase its elasticity. Speed also seems to help in this restructuring of the fascia.

Along those lines, a study by Gale et al. (2007) looked at grip strength in the elderly as a predictor of mortality rates. Grip strength can be improved by muscular use and it gives a pertinent assessment of fascial competency in functioning. Improvement in fascial competency, due to an increase in grip strength, lessened deaths from cardiovascular disease and cancer in the test subjects.

Conclusion

This discussion of fascial recoil covers the basic properties of elastic recoil inherent in fascia, as presented by Spohr at the 2016 FRSS. It shows its power and primary importance in human organization relative to gravity and in basic principles of movement. Healthy fascial recoil is also a predictor of vitality, aging, and mortality.

Wiley Patterson, MD, graduated from medical school in 1978 and has been a Certified Rolfer since 1992. He completed his Advanced Rolfing training in 1999, Rolf Movement® training in 2008 and Somatic Experiencing® training in 2018. He began studying osteopathy in 1999 and continues attending osteopathic classes. He started the Austin Structural Integration Study Group that has been meeting in Austin, Texas, for the past six years. He has organized classes and conferences for the Red River Region of the Dr. Ida Rolf Institute®.

References

Gale, C.R., C.N. Martyn, C. Cooper and A.A. Sayer. 2007. Grip strength, body composition, and mortality. *International Journal of Epidemilogy* 36(1):228-235.

Hoffren-Mikkola, M., M. Ishikawa, T. Rantalainen, J. Avela and P.V. Komi. 2015. Neuromuscular mechanics and hopping training in the elderly. *European Journal of Applied Physiology* 115:863-877.

van der Wal, J. 2020. *Fascia, fabrica or fabric: On the origin of fascia*. Available at https://bit.ly/3JErZ1X