THE FUNCTION OF FASCIA

Trends come and go in the fitness industry but 'functional' and 'fascial' have been around for a while. **James Earls** explores the function of fascia.

Heated debate surrounds what constitutes 'functional' movement and exercise, much of which involves rolling around on the floor with various lumps of plastic and foam (with and without vibration included) to release, open and stimulate our fascial tissues.

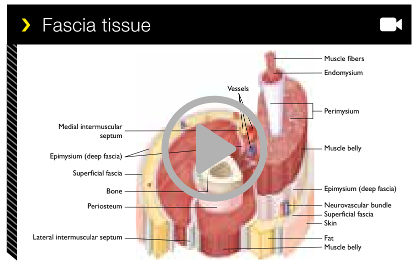
Finding the definition of what is 'functional' and what is 'fascia' may be useful as we move the industry forward. Although 'functional', like so many aspects of movement theory, can be defined by the preference or allegiance of whoever is at the front of the room, fascia at least has an official definition: "Fascia is a sheath, a sheet, or any number of other dissectible aggregations of connective tissue that forms beneath the skin to attach, enclose and separate muscles and other internal organs."[1] This sweeping definition has been further refined to allow fascia to be considered a system made of "soft collagen containing loose and dense fibrous connective tissues that permeate the body".[2]

An aim of this article is to improve understanding form and function of anatomical structures, not for their own sake but to enhance application of exercise. One suggestion to 'functionally train' the fascia is to use multi-vectoral movement – but is that enough to target the roles and functions of fascia, rather than simply responding to its continuity? If we can appreciate the *functions of fascia*, then we can come closer to training it *functionally*.

> ***"The springy gait of the kangaroo is the archetypal example of the spring-like role of tendons"***

Figure 1

Each muscle fibre and the bundles of muscle fibres are enclosed within fascial sheaths – endo-, peri- and epimysium. Gradually, the sheaths come together to form tendons for each muscle and all the body is encased within a fascial layer, the deep investing fascia (not shown). Each tissue level plays a number of roles during movement. See video for more information.

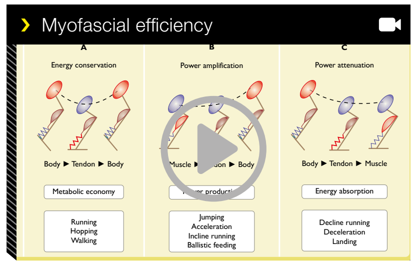


As an all-encompassing tissue, fascia has many functions depending on its location and associated organ. As movement teachers, our primary concern, and the one we will cover in this article, is fascia's role alongside the muscular system. Of course, neither muscle or fascia can do much for themselves and we should really refer to the myofascial system because to exclude either element would result in a relatively inert, useless tissue remnant. Collagenous tissues provide form and support to muscle, while muscle fibre provides tone and tension to the fascia (Figure 1 and Video 1). Together, they create an interdependent system that provides force transfer to and from the skeleton.

Recently, the elastic ability of the myofascial has garnered a lot of attention[3] but myofascia provides at least two other benefits to our 'functional' movement system (Figure 2). Along with elasticity, muscle's fascial wrapping also provides significant increases in potential power production and it facilitates reduction and absorption of kinetic energy. Each of the three dynamics – metabolic economy, power production and energy absorption[4] – harmoniously interrelate to manage the ebb and flow of forces during complex movement.

Figure 2

The main functions of myofascial tissue during movement



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The first, and perhaps most familiar, benefit of the fascial elements is their ability to lengthen and recoil as elastic tissues. The spring-like mechanism within tendons has been researched for many decades but was initially better known within animal locomotion[4, 5]. Many studies performed over the last 60 years show how momentum, during rhythmical and repeated movements, can be recycled to minimise metabolic cost. Using momentum allows the muscle fibres to remain close to isometric, thereby reducing oxygen and ATP use.

Many tendons and aponeuroses appear designed to optimise their spring-like role for human movement. The Achilles' tendon[6], the plantar fascia[7] and the iliotibial band[8] are common examples. Much recent research into these areas has been driven by the rise in interest in barefoot/minimally shod running, which makes claim to increased efficiency by encouraging a more 'natural form' and allows loading of the elastic tissue[9] by using a series of bent joints (hip, knee and ankle) compared to the straight leg strategy of walking and jogging.

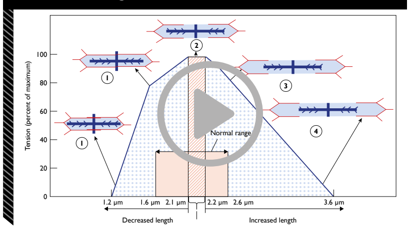
If joints are bent during ground impact, more load is put into the soft tissues around each joint. However, rather than lengthening and shortening muscle fibres during the movement, momentum is used to lengthen the collagenous springs which then recoil to aid the return movement. Whether it be the land from skipping or running, it appears that any repeated and rhythmical movement allows the muscles to stay close to isometric. Without having to change length, the actin and myosin filament relationship can optimise potential force output by staying within the optimal force/length relationship (Figure 3, Video 2).

Recent studies show that many muscles appear to predominantly operate on the ascending portion of the curve[10, 11] rather than travelling back and forth over its peak. From a functional point of view this makes sense – if muscle is decelerating and controlling momentum, the myofascia will be lengthening and the joint moving towards end of range. The system therefore benefits from an increasing force output as the myofascia lengthens and joint leverage increases. If muscle fibre length swung back and forth over the peak of the force/length curve, the muscle would weaken as it lengthened down the right side of the curve. The body's use of fascial tissue to absorb strain allows muscle fibre to act within its optimal range to control movement – the combination of fascial elasticity and optimal force/length relationship assists overall efficiency and power output (Videos 3 and 4).

Figure 3

Force/length relationship of a muscle

› Force/length curve



› Force/length curve 2

As Roberts and Azizi[4] point out, the springy gait of the kangaroo is the archetypal example of the spring-like role of tendons but there is much more to them. Tendinous tissue is in-series with the various layers wrapping around and supporting the muscle fibres and fibre bundles. These fascial 'bags' (Figure 1 and Video 1) also provide compressive support to the muscle to assist power production. Loss of integrity within fascial compartments, such as following a fasciotomy (surgical splitting of the muscle's epimysium), causes decreased force output[12, 13]. It now appears that we can add a further benefit of compression from the fascial tissues to assist muscle force output.

A third benefit is power attenuation, or damping, which is required when decelerating or coming to a stop, such as landing after a jump or running downhill. In the previous example (Figure 2), we can see the energy (shown in red) is in the pelvis, just as with the first example of energy conservation. That energy is transferred to the Achilles' tendon, which lengthens in response to dorsiflexion driven by the landing. Because muscle fibre produces less force with increased velocity, the amount and speed of the force associated with rapid dorsiflexion may be too much for the soleus and gastrocnemius to control through eccentric lengthening. Sending the force into the tendon first allows the muscle fibre to lengthen at an appropriate velocity. The offset in timing between loading the tendon and eccentrically lengthening the muscle fibre protects the fibres and produces more force to control the movement.

Now we have three major functions of fascia in place, how do we change our training?

Well, probably not much – the key is variation:

1. Play with speeds as well as vectors: fast and slow movements, plyometrics and landings all affect the fascial system.

2. Play with tissue loading – allow preparation in the opposite direction to load elastic energy and then prevent it to focus on muscle fibre. One thing we know is that fascial elements love momentum – initiating a movement by going in the opposite direction first is not 'bad form', it's just a variation. It could be a compensation for lack of force production; it is certainly a strategy for those last few reps. Now we know why – it lengthens the fascial elements, loads elastic energy and optimises muscle force/length relationships to increase power. ***fp***

BIOGRAPHY ▶

Based in London, James Earls is a writer, lecturer and bodyworker, specialising in myofascial release and comparative anatomy. He is a graduate of the Gray Institute's GIFT training and recently completed an MSc in human anatomy and evolution. James has authored two books – *Fascial Release for Structural Balance* and *Born to Walk*, and, in between walks and workouts, is currently working on a third. James can be contacted via .borntomove.com and Instagram @born_to_walk

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