Training, weight work and sports specifics

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The human body does not wear out with use. On the contrary, it wears down when it is not used.

Christopher Alexander *et al.* (1977)

Training fascia

What is fitness and what is the goal of fitness anyhow? Attempting to define "fitness" can bring up many opinions, including efficiency of movement, healthy weight, ability to perform walking or running actions, etc. If we are unable to perform daily tasks, all the exercise in the gym is not serving a purpose. If we are training for a performance athletic task, we want to be able to accomplish that goal with less effort and more efficiency. Timing is everything. We hear that a lot in life and in fascia the same is true. We can also add that context is everything. What may make sense for one type of athlete or body, may not for the next. Immediate movement for the fascia before swimming, for example, may increase the range of motion through tissue hydration.

The way we think and train has changed dramatically, from the aerobics craze of the 1980s to newer ideas of "functional fitness" as well as the growth of yoga, Pilates, and other minded and mindful movements. Our traditional way of looking at the body was to focus on the muscle-based system. Gyms are still filled with machines that highlight the individual muscles, but mindful movement is having its moment. An image can capture a moment or a pose that might look photogenetic but lack movement or functional integrity. My friend David Jacobs, a mobility coach, talks about entering every session with the mindset of a "creative-humble-facilitator." As he puts it, "we can't fix humans. They are not broken. Things break. Humans require healing and I just try and help provide a path for someone to reach that state" (personal correspondence).

Fascial awareness has led to new strategies for training the body with multidirectionality, vectors, and more global ways of looking at the body. In late 2020, Emily Harrington became the first woman to free climb El Capitan via the Golden Gate route in one day. Free soloing is a style of rock climbing where no ropes or harnesses are used, other than a rope below used to break a fall, or sometimes without a safety rope at all, as was done by Alex Honnold on his famous ascent. Harrington is reported throughout the climbing community to have kept herself going with the mantra, "slow is smooth, smooth is fast."

Building a body for movement

Fascia trains slower than muscle, but it is more resilient if it is trained well. So, the shape of our fascial organization is important to consider. Forces in the body organize our fascia, and then our fascia organizes what the cells in the body do. We have looked at the general concept of tensegrity, but this concept at the cellular level is important. If collagen is a cell product, the shape of what it becomes is interesting, as it forms a triple helix, like a strong, woven rope. The Golgi tendon organ nerve ending goes into the tendon, and with pull, the helix of the collagen is straightened and unwound a bit. Without the ability to load, the crimp of the fascia loses it shape. Why should we care? If you have a client that hasn't stimulated their fascia in a while, either through inactivity due to injury or mental state, that body is going to have a slower time with new load.

Proprieties of training fascia for the movement professional

Now that we have a basic understanding of fascia, we can start to look at the major concepts in training fascia (Figure 11.1). Healthy fascia has a high ability to slide between layers, and there is an elevated density of proprioception receptors in this area, critical for professional and daily movers alike.

Elasticity

A loss of elasticity in the body means that the tissue can no longer stretch properly. Here, fiber content may be high and there is stiffness in the tissue. Think of adhesions, for example, in a plantar fasciitis. In discussing elastic bands, we can use a term called the coefficient of restitution, which is how long you can hold the elasticity, and how fast the elasticity can recoil. Tissue can only hold elasticity for about a second. When you are running, the Achilles tendon stores and returns the energy.

As a kid, I took the time to loop together rubber bands to create a ball made up of the elastic bands gathered from the newspaper and various grocery store items. The coefficient of restitution for any rubber-based ball is very high, but also very short. The surface of both the ball and what it bounces against makes a difference. A superball in its smoothness has a high coefficient of restitution. My kitchen floor may be an ideal place to bounce that ball, but my carpet will quickly absorb the extra energy. Up until recently, there was a poor understanding of the effects of training on tendons and the ability to increase elastic storage. Reeves (2006) found that exercise groups training with resistance had increased elastic storage capacity and implied increased tendon loads.

The classic example of an efficient bouncy and elastic quality of movement is that of the kangaroo in its efficient gait (Sawicki *et al*. 2009). The bounciness of its hop is not adequately explained by muscular action alone. Kram and Dawson (1998) discussed in their studies the catapult mechanism, where the elastic energy is stored in the fascia through pre-loading. In cultivating elastic rebound, we are looking for the ability to control deceleration and acceleration.

Fibroblasts (the cells that create more fascial fibers) respond to load and architecturally remodel the collagenous connective tissue depending on the movement (or the lack of movement) that body encounters. If the body does not get challenged, both a loss of flexibility and strength can occur, and fibrosis can build up.

Plasticity

Plasticity is about the stretch in the tissue that can deform the body system. Consistent stretch will make the fibers slide apart while a sustained stretch will create new bonds and change the tissue. This is why we warn athletes that there is a loss of strength immediately after a sustained stretch session (Magnusson *et al*., 2010). As noted in the abstract of the article from *Nature Reviews Rheumatology*:

> *Mechanical loading of tendon tissue results in upregulation of collagen expression and increased synthesis of collagen protein, the extent of which is probably regulated by the strain experienced by the resident fibroblasts (tenocytes). This increase in collagen formation peaks around 24 hours after exercise and remains elevated for about three days. The degradation of collagen proteins also rises after exercise but seems to peak earlier than the synthesis. Despite the ability of tendons to adapt to loading, repetitive use often results in injuries, such as tendinopathy, which is characterized by pain during activity, localized tenderness upon palpation, swelling, and impaired performance. (Magnusson et al. 2010)*

So what does some of this mean for the movement practitioner? If we put sustained stretch on the fascia, there is a time of weakness after a heavy stretch session or yoga (depending, of course, on the style). After 24 hours there is a deficit in tissue, whereas after a few days the tissue can actually come back stronger. In sports such as football, there is a need for strength during a game. If there is a strong stretch session happening, the body actually needs time to recover. Over the years teaching athletes at the university level, I've been careful to pay attention to the sports activities that they are doing and their schedule of games.

Multidirectionality

We are looking to load fascia in multidirectional movement and dynamic action in order to increase fascial elasticity (Fukashiro *et al.* 2006). We can think of movement as energy that is directional in nature, like a vector, although of course the body is much more sophisticated than a simple line of force. Luckily, physics can handle these multilayered ideas and vectors can be an interesting and accurate way to describe movement of the fascial tissues. In graphing vectors, the visual represents position, a displacement in position, acceleration, and velocity. These also have relevance in a body of water, as much as in a human body, made largely of water. In water, multiple parts can be in motion in different velocities. A vector field is defined as these different areas of velocity.

Differential movement

When we move, we have layers that slide against each other and move over other layers. The idea of geology is useful here. The slow move and glide of plate tectonics for example, is similar to the shear and glide of muscle and fascia sliding. Ida Rolf has been quoted as having talked about the muscles having the ability to move against each other "like silk stockings" (Personal communication, Myers 2018). Differential movement can be thought of forces from different areas affecting the foundation of another. For example, the tree roots growing under my old house caused changes to the soil that shift the structure above. Muscles with their fascial compartments may also, in essence, not be working so much with the idea of origin and insertion, but in relationship to everything around them.

Remodeling

Remodeling is done over a slower time. Unlike bone, where the calcium is repairing, in fascia the collagen fibers are knitting together to repair an injury. In the past, bones used to be held in place for a long time, which gave them the opportunity to rebuild, but if you wait too long, the fascia gets weak. Fascia needs reorganization through movement.

In 2002, Järvinen *et al.* found that immobilizing the body after injury creates a felt-like collagen arrangement and lack of "crimp" (the classic wave shape a crimping iron makes with hair); the organizational shape that we look for in healthy tissue. Muscle takes around five to eight weeks to remodel, but fascia takes much longer—anywhere from six weeks to two years. For an athlete that is training quickly, the injuries that develop are fascial tears, as the muscle may have expanded, but the fascial net has not yet had the time to remodel.

If we are training just individual muscles, such as we would do at a traditional gym with machine work, the fascia in between the muscles is not trained effectively, nor is the coordination. To train the long myofascial chains or any named connections, there is an important piece to consider. Focusing on the longitudinal lines in force transmission will impact especially postural patterns over long periods of time. Over short periods of time, latitudinal or parallel force transmission is more common in the body.

If you are working out at the gym and isolating and "strengthening" your quadriceps on a machine by pushing your ankle against a bar as you extend the legs while lifting the bar, you are training your body as a machine, not as a body that can be dynamic. In this particular example, one could cause sacroiliac issues if the quads are overtrained without the idea of stabilization as we need in daily life.

We also need to train the fascia in-between the muscles. This includes moving, lubricating, and looking at the intermuscular septums as being part of a new area of training concept that concentrates on the longitudinal force transmission. Fascia can be thought of as a force dispenser in series as well as in parallel. Peter Huijing's work (2007) furthered the concept that in addition to the longitudinal force distribution of the myofascial meridians, fascia can also be distributed to parallel structures and antagonists. When Huijing loaded rat tendons, the majority of the force (around 70%) does go to the proximal attachment, but an additional 30% goes to nearby structures.

In brief, when we use the body effectively, we need less effort to move the body efficiently. As noted by Elphinston (2019) in describing battle ropes:

Many people brace their bodies against the load of ropes, eliminating the potential offered by their legs, and thereby increasing the demand on their shoulders. Some even bob up and down with their knees, assuming that this energy will somehow make it past their rigid midsection. Ultimately, though, the ropes should mirror the ripple of energy moving up through the body, and this can only be achieved by sinking the body into the feet, transforming the legs from tense to elastic, and allowing their energy to transmit up and out through the hands. (Elphinston 2019, p.35)

When we are looking at fitness and sports, we need to also take a moment decide how we train movement and performance. Noted trainer and fascia enthusiastic, Dr. Wilbour Kelsick has noted, "You cannot train body parts in isolation and expect to have efficient global functioning and training for runners must be elastically functional and global in its approach, inclusive of the entire body mechanism and not just the lower extremities" (Kelsick in Schleip, Baker, and Avison 2015).

FIGURE 11.1 Training fascia is a relatively new concept. It responds to stimuli and mechanical stretch loading. By creating a myofascially adaptable body, we are able to engage in more areas of human daily and athletic performance with greater ease. Photo courtesy Lori Officer.

Sports and play have an interesting history and an interesting piece in the body. Ask any athlete from the elite to the reactional weekend warrior what are common injuries, and most will respond with names of connective tissue injuries from Achilles tendon tears to tendonitis.

Walk this way

Before we get into other sports, the most basic movement that we build upon for other sports and movement is the basic action of walking. As noted by Zorn:

not only is walking, besides running, probably our most natural way of moving, the one that most closely corresponds to our body structure, but it can also be a dynamic form of meditation, that is to say, walking can easily combine movement and contemplation. Now, while it is true that almost anyone can lumber around or shuffle their feet, I believe that walking "correctly" is actually a great challenge. My hypothesis is that to walk "correctly", you need to walk "elastically". (Schleip et al., pp.161–2)

Nutrition and fascia for the body

I knew my university student track athletes were highly interested in how to recover from their own trail runs, and many rehydrated with water and various sports drinks. Not a big fan of the sugar content and artificial colors, I became interested in the latest research in fascial sports and wellness. Bone broth intrigued me for its high collagen content. Could rehydrating after a run or hike with bone broth be a healthy option for sports hydration? This is still a question under debate, but boiling connective tissues from animals (including skin and largely bones) does release of collagen in the form of gelatin.

Boiling the skin, bones, and other connective tissues of cows, pigs, fish, and other animals results in the release of collagen from within the tissues in the forms of gelatin (denatured but mostly intact collagen protein). To make hydrolyzed collagen, the gelatin is further broken down using acid or enzymes such as pepsin, papain, bromelain, or protease. Therefore, the amino acid content of gelatin and hydrolyzed collagen is the same. The main difference is that one forms a gel, and the other does not. (Steffen and Baar in Lesondak and Akey 2020)

Collagen synthesis also depends on vitamin C, which is generally fairly prevalent in modern culture, which is important as it helps to hold fibers together. Trabold *et al*. (2003) demonstrated that lactate creates collagen synthesis, leading to the interesting question of whether lactate accumulation is, in part, creating fascial fibrosis.

Thought box: Walking as an "indicator species"

Indicator species can be organisms of any kind that give an indication of the overall health in any environment. In her book *A Field Guide to Getting Lost*, author Rebecca Solnit (2017) discussed walking as an "indicator" species that determines the overall healthy checkup of the system. Walking can be a type of indicator of something larger in the system. If the act of walking is diminished or lost, it may be an indication of what is possible for the body in larger levels.

Fascial tensioning for the weight-bearing athlete

If we consider some of our actions in sports from launching a javelin to swinging a hockey stick backwards in anticipation of hitting a puck, we are myofascially tensioning the body like a spring, ready to change its state from potential energy to kinetic energy. As noted by Lesondak (2017):

Energy storage in tissues around the shoulder allows the human to throw at speeds over 100 miles an hour, compared to 20 miles per hour in primates. Pre-contraction of the muscle stretches connective tissues, which then explosively release to accomplish a movement for which muscle power alone would be insufficient. The storage is diffused across a network of as yet undefined tissues, but the "wind up" for the baseball pitch indicates the whole body is involved. (p.141)

Through proper training of the tensile work of the fascial system we can actually create more power. Stabilization of the joints is important before we get to mobility in the rest of the body. Having a mix of strength, but letting it go when we need to, is key. Fascial tensioning may be more the felt sensation than muscle tension.

Thought box: Can you grab the cereal box on the top shelf?

As we start to look into different forms of movement, we will also keep this idea in mind for myofascial movement and its application: Does the movement we do have a purpose in the functionality of the myofascial body? The push in the modern fitness (starting in the 1960s) and movement industry has focused on machines designed for the "body as machine" concept. The very first patent for a treadmill was issued in the US in 1913 and gained momentum through the following decades. Repetitions of exercises such as preacher curls might make one strong in a very limited way but lacks the multidirectional training and unpredictable load that is important to a body that lives in the world and contends with picking up children or running down a city street to catch a bus. "Functional fitness" is prepping the body in movement to have better resiliency for common daily life situations.

Fascia is an organizer of shape, and movement organizes through patterns and rhythm but needs a wide range of challenges. If the structure is unable to sustain a movement, injury will occur. This is an important piece in understanding our healing and training. Fascial injuries (including cartilage, tendon ligament, and joint capsules) take longer to heal because of the lack of vascularity in the fascia.

Most of our clients don't get injured in a big athletic event. Instead, they injure themselves reaching for the box of cereal on the high shelf or turning in the car to retrieve an item from the back seat.

Movement lab: Functional fascia training for indoors and outdoors

If most of our waking hours are spent indoors, how can we incorporate fascia training into a relatively static environment? During the pandemic, for many, this indoor time increased during periods of lock down.

Some thoughts:

1. Change the way you move in dynamic shifts. Think like a choreographer. Do you usually stay at eye level as you move through your house? Could you shift to crawl, or stand on tiptoe? Can you move quietly? Can you occupy space when you enter a room? Vary your movement drivers, but also vary your movement levels.
2. Use your counters and furniture to explore climbing. Stimulate the skin for proprioception.
3. Vary the way you approach a typical task or space. If you always sit in the same seat, change your place. Better yet, change the furniture or vary tasks without furniture.
4. Think of linking two activities together for more dynamic changes and to challenge coordination.

Breakout box: Using myofascial concepts in building a varied approach to movement

Mike Fitch, Creator of Animal Flow

When people ask me what Animal Flow (AF) is, I'll usually tell them, "If you were to see someone practicing Animal Flow, it would look like a mix of yoga, breakdancing, modern dance and gymnastics". But the experience of AF is completely different to each practitioner. To some, it's their daily workout, while to others it can vary from a movement meditation, mobility training, cardiovascular conditioning, skill practice, or something they use to fill in the gaps of their other go-to exercise strategies.

Over the years, the program has evolved and while the movements have become even more finely tuned, the inception of AF was deeply based on my understanding of anatomy and the needs of the human body (Figure 11.2). The entire program is set to achieve the following goals and concepts:

1. Articular variability: move every joint in as many directions as possible, especially those angles that the person would not explore on a daily basis.
2. Ground based movement: the majority of AF movements are quadrupedal. Closed chain, quadrupedal movements are excellent for creating a proprioceptively rich environment, where the participant must move their body around an object (i.e. the floor) versus move an object around their body.
3. Load the body globally: the AF movements were designed with the goal of loading the muscular subsystems and fascial lines in both shortened and lengthened positions. This creates a variety of loading patterns that focus on tissue synergies versus single muscles.
4. Body/brain challenge: there is an entire language built around AF that allows the instructor to "call out" a command, which encourages a speedy reaction time of the participant. Even without the call outs, it was proven that a four-week AF program improved markers of cognition in the study "Quadrupedal movement training improves markers of cognition and joint repositioning". (Matthews *et al.* 2016)
5. Fun: it's widely known that if a person enjoys the exercise task, then the adherence to the program is higher.

FIGURE 11.2 Animal Flow is a practice built from goals and concepts of articular variability, ground based movement, loading the body globally and challenging the brain and body through fun. Photo courtesy Mike Fitch/ Animal Flow

Reference

Matthews, M. J., Yusuf, M., Doyle, C. and Thompson, C. (2016) 'Quadrupedal movement training improves markers of cognition and joint repositioning.' *Human Movement Science*, *47*, 70–80. https://doi.org/10.1016/j.humov.2016.02.002

Biomotor abilities and fascia adaptation

The focus on biomotor abilities has gone in and out of style over the years among athletic trainers. These abilities are critically important if the goal of the training is to improve a practice for overall performance, not just for the drill itself. Depending on the source, there are anywhere between three to eight biomotor abilities defined as critical to practice from strength (optimal, absolute, limit, and relative), power (starting, reactive, eccentric, and optimal), endurance, speed, coordination, flexibility, agility, and balance. As interest in fascia has continued to grow, more sports scientists are looking at the relationship of fascial restrictions and kinetic chain issues. In one study by van Pletzen and Venter (2012), the researchers used the Bunkie (Brumitt 2015) to determine performance selected physical tests (agility, speed, explosive power, and muscle endurance). This designed test involves simple stabilization with a chair or bench in the following named lines: posterior power line, anterior power line, posterior stabilizing line, lateral stabilizing line, and medial stabilizing line.

Breakout box: The strength of cumulative sub-maximal load

Travis Johnson PhD, FAFS, CSCS, CFSC, Kinetikos

I landed on Kodiak Island, Alaska in the spring of 1993 and nearly had my hand broken. At least that's what it felt like. I stepped in for a cordial handshake with the captain of the fishing boat I would be working on for the next four months and found myself caught in a vice grip the likes of which I had not experienced before. About two hours later I met his neighbor and made the same mistake. It was even worse: bones grinding as I struggled to generate the barest amount of opposing force to uphold my end of the greeting.

Interestingly, neither of these men was particularly large nor imposing in size and stature. In fact, I was taller and probably outweighed them both. The term that comes to mind is "wiry".

They were not anomalies either. Over the course of that summer, I met lots of people that were far stronger than one would imagine, and the common denominator seemed to be many years of continuous work in the fishing industry.

Similar observations have been noted in farming communities. Renowned Canadian exercise physiologist Michol Dalcourt frequently mentions that the farms kids on hockey teams were overwhelmingly stronger than their city-dwelling counterparts, regardless of the weightlifting the city kids did at the gym.

To explain this, people often focus on the complex movements and load variability the fisherman or farmer is exposed to that creates better integrations and linkages through the body overall (compared to classic strength lifts).

However, it was RKC instructor Troy Anderson that really got me thinking about sub-maximal loading and volume over time. Having grown up on a farm, Troy explained that work on the farm is not about doing a couple max weightlifting efforts and then resting the remainder of the day. Nor is it done 2–3 times per week with rest days in between. Rather, farm work is hours of sub-maximal loading all day, every day involving a variety of tasks.

Consistent repetition of these workdays over many years leads to the kind of strength associated with farmers, as well as the fisherman I met in Kodiak and many other manual labor professionals.

To keep the discussion simple in a limited space, I should clarify that I am considering maximal loading to be repetitively working at one's maximal effort and/or taking muscles to total failure. Thus, sub-maximal loading would NOT involve repetitively working at maximal effort or taking muscles to total failure. For a visual reference: imagine chopping and stacking a bunch of firewood or digging a 4-foot-deep trench for 20 feet in length.

Considering that the fascial network organizes force created by muscles, it behooves us to have fascial integrity that can aptly support the forces muscles generate (in addition to the forces we face from gravity, ground reaction, and mass and momentum).

One could even speculate that in the absence of sufficient support structures, the nervous system would down-regulate the force-generating capacity of our muscles.

While it is widely recognized that a resistance training program will create adaptation first in the nervous system, followed by the muscular system, and finally in the fascial/connective network. It is often overlooked that months and years are required to achieve even moderate thickening and strength adaptations in connective tissue. Long-term, frequent, and consistent exposure is necessary.

Achieving frequent and consistent exposure to load can be difficult in the face of popular belief that load based training should always be followed by a 36–48 hours rest period. In fact, when considering collagen degradation and synthesis following bouts of exercise, the research seems to suggest that training should only be done 2–3 times a week.

However, what people usually do in exercise bouts is strive to work near maximal effort and repeatedly take muscles or regions to failure … in which case, of course, longer recovery periods are mandated.

To achieve the frequency and consistency found in physical labor populations (and dare I say, reap some of the same structural strength and resiliency benefits), sub-maximal loads can be used every day, with maximal or failure loading occurring periodically at planned instances throughout the week, month, and year.

From the perspective of practical application, making time to train every day is feasible, though day-long work/training sessions are an impossibility for most people. But a similar training effect might be possible by simply creating more time under constant load during a typical 45–75 minutes training session.

If I consider training in a more fascially focused running style, I am going to vary my speed and intensity, and, for much of my past few years,

FIGURE 11.3 Running smoothly is an act of myofascial efficiency in coordination. Photo courtesy of Gail O'Reilly/Zenergy.

I've focused on changing my footwear with every other run. Our storage capacity for elastic energy can be cultivated, particularly through the plantar aponeurosis and Achilles tendon.

Zenergy Running

Gail O'Reilly

Running requires balanced fluid motion. I advocate that you should run with kindness, patience, and always lead with an open heart. Run with the intention to feel unified and connected, because every part of the body must perform together to create harmonious and healthy movement (Figure 11.3).

Developing an integrated, whole, and mindful approach will enable a natural, responsive, and efficient encompassment of the body's fascia webbing and myofascial meridians. To help runners perform to their true potential as well as produce more elasticity, improve energy expenditure, reduce injury, and create feedback of positive sensations, I propose adopting a methodology of small refinements and adjustments based upon the whole body and interconnectivity of myofascial meridians.

A small adjustment in the position of the upper body, for example, "elevates" from the arches of the feet upwards, bringing the spine into neutral alignment, lengthening the myofascial connections, stabilizing, and decompressing. This simple change in posture while running is the basis upon which the other adjustments and refinements in technique build upon.

Adjustments to the chin and eyes intensifies the inner focus; adding a smooth arm glide creates essential rhythm in association with the leg stride and a shift of weight into the balls of the feet generates a springing effect.

A change in breathing technique helps restore healthy functioning in all myofascial meridians.

Finally, the icing on the cake is a technique I call dissolve, that powerfully connects the mind and the body on a deeper level.

All these small improvements add up to bigger gains and make running more enjoyable and efficient for the runner.

Breakout box: Stretch to Win

Chris Frederick

Dynamic Stretching for Movement

Dynamic stretching is one choice among several that can help a person warm-up and prepare pre-activity or cool down and help recovery post-activity. On a spectrum of preparing for any full body movement, fitness training, or sports, a common dynamic protocol would be to start with range of motion (ROM) exercises, then progress to dynamic stretching before participating in more specific drills for a physical fitness session, competitive athletic, or dance event. Adding and ending with ballistic movements for an even more complete warm-up (e.g. in fitness—partial squat progressed to full squat progressed to burpees) would be appropriate if preparing for performing power movements in any physical training, sports, or dance (Frederick and Frederick 2017).

A full body (or isolated torso and/or limb) movement performed through a partial or full ROM without encountering tissue or joint resistance would qualify as a ROM drill, practice, or exercise.

If one feels and then moves through any resistance that is felt beyond the normal ROM for a specific movement, then that experience qualifies as dynamic stretching in contrast to static stretching. It is often easier to feel this resistance in one's body when movement is done at slower tempos.

It is noteworthy that based on consistent, recent research that has emerged regarding warm-up and stretching protocols (Behm *et al*. 2016; Kallerud and Gleeson, 2013; Opplert and Babault, 2018), dynamic stretching has been newly prioritized as an essential element in fitness training by leading evidenced based educational institutions for fitness professionals (Sutton 2021).

This author has educated and trained professional dance companies and individual dancers in the importance of replacing a dominance of traditional passive static stretching before practice and training in favor of dynamic stretching. Anecdotally, this change was immediately successful in all cases by greatly reducing injuries, early fatigue, and chronic strain in addition to improving proprioceptive awareness.

Dynamic stretches are commonly done while standing. Here I present more options, done on the floor. I have devised a dynamic stretch program called the Core 4 to be used pre- or post- activity. The following stretches make up a dynamic progression from ground movements that can be added preparatory to more vigorous standing movements. It is best to do them after a light warm-up such as an easy jog/run, stationary bicycle, or other relatively effortless activity for 5–10 minutes—just enough to generate very light perspiration.

The stretches engage entire myofascial kinetic chains and nomenclature in therapy, fitness and sports may vary. Terms such as slings, links, lines, and nets are currently in common use. For this program, stretches are named after the targeted general anatomical regions.

General guidelines for dynamic mobility preparation:

- Compare how you feel and move before and after these stretches. Over time, you will know which ones are the most beneficial and how to vary based on need.
- Make your movements flow.
- Exhale into the stretch, and inhale coming out of the stretch.
- Don't count reps; rather, finish the movement when no longer making gains in flexibility.
- If the movement doesn't loosen you up enough to perform, then do SMR (self-myofascial release) on the problem spot and try the stretches again.
- Never let your spine sag, but never hold your core so tight that you can't move well during the stretches.
- These are dynamic stretch movements; you should not feel a big stretch. Use less intensity and faster tempos and do as many reps as are needed to feel more mobile but still strong and ready to perform.
- For cool downs, perform the same movements but about 3x slower by taking slower and longer breaths resulting in prolonged stretches. Make the stretch movements last longer so that you are still moving and not holding the stretch (unless you are doing a static stretch for different reasons and purposes). Explore different angles in each movement to customize your needs at that moment.

Core 4 on the Floor™

The Core 4 program has been successfully used as both an assessment and flexibility exercise program on thousands of clients and students. It focuses on dynamic flexibility preparation of the core myofasciae of your lower body and progresses to your upper body. The initial focus is dynamic core mobility, and the progression integrates motor control and dynamic core stability. This routine applies to most activities and sports that require optimal core control (Frederick and Frederick 2017).

The Core 4 is made up of the power-generating regions for most movement in fitness and sports. In terms of bones and joints, this would be your lower lumbar–pelvic–hip area. In terms of myofasciae, this would be all your core muscles and fascia (lumbodorsal or thoracolumbar fascia, transversus abdominis, obliques, deep and superficial back extensors, iliopsoas, glutes, and deep hip rotators). These muscles and associated fasciae, especially those surrounding the hips, provide the foundation for many athletic movements that athletes depend on for performance. Therefore, it is extremely important to achieve balance in mobility in the Core 4 to generate the energy-efficient, powerful functioning that is required in most sports, dance, and in high-level fitness training.

Dynamic stretching to improve mobility in the lower body first makes sense because it is the base or foundation for most sport and athletic movements. Four key lower-body muscles and their kinetic chains are identified that can be focused on to improve mobility:

- Glute, hip, and back warm-up (includes myofasciae below in the proximal hamstring and above in the lower to upper back and neck).
- Rotation warm-up for hip, back, and neck (includes quadratus lumborum bilaterally and myofasciae around the entire waist and hips below and into the torso rotators and neck above).
- Hip flexor warm-up (includes iliopsoas and the myofasciae below in the thigh and groin and above along the entire front of the abdominals and neck).
- Lat to low back warm-up (includes latissimus dorsi and myofasciae from the low back and pelvis on up to the shoulder and chest).

Note that the latissimus dorsi is included in this group because it attaches to both the lower back and the pelvis, as well as to the shoulder. It functions as a kinetic bridge that connects the lower body to the upper body.

The Core 4 program opens areas that may be causing restriction around your hips and low back, which will also help regions higher up (e.g. the spine and shoulders) and lower down (e.g. the knees, ankles, and feet) because of the long, extensive connections through your connective tissue network or fascial net. Complete the entire Core 4 on one side of your body before stretching the other side.

1. Glute, hip, and back warm-up

Instructions

1. Sit on the floor and place one leg in front and one behind and bring the front foot inward until the foot touches the back knee, or as close as possible (Figure 11.breakout.1a). Position your weight so you are sitting more on the glute of the front leg. Adjust for comfort. Place your hands in a push-up position in front of you with the arms straight.
2. As you inhale, lengthen the whole spine up through the top of your head; then, exhale and move down and forward over the knee, keeping the spine long (Figure 11.breakout.1b).
3. Roll up through the spine back to the erect starting position. Repeat 3x or as needed.
4. From the last repetition above, take the torso forward to the left and right of the knee at different angles to target the different glute fibers

(Figure 11.breakout.1c and Figure 11.breakout.1d). Repeat both directions 2x or as needed.

Tips

- Breathe and wave into and out of the stretch until you feel your tissues release.
- Drop your body closer to the floor and move from side to side.
- Complete the rest of the following stretches before doing the other side.

FIGURE 11.BREAKOUT.1A

FIGURE 11.BREAKOUT.1B

2. Rotation warm-up for hip, back, and neck

Instructions

1. From the glute stretch position, turn, and walk the hands toward the rear until you feel a slight stretch in the back, hips, and/or legs (Figure 11. breakout.2a).

FIGURE 11.BREAKOUT.1C

FIGURE 11.BREAKOUT.1D

2. Keep the hands still and lean toward the hand that is on the same side as the front leg, and inhale (Figure 11.breakout.2b).
3. Exhale as you lean back again.
4. Repeat 3x or as needed.

Tips

- Walk the hands out a little farther with each repetition to progress the stretch.
- Complete the rest of the following stretches before doing the other side.

3. Hip flexor warm-up

Instructions

1. From last position in the previous stretch, place the back forearm on the ground and find

FIGURE 11.BREAKOUT.2A

FIGURE 11.BREAKOUT.2B

a stable position for the shoulder, where you can balance on that arm with your full weight. Slide the forearm to the rear as your back starts to arch and stop when you feel a mild stretch. Inhale and lean forward on both hands (Figure 11.breakout.3a).

2. Exhale while you arch the back and look up to ceiling (Figure 11.breakout.3b) feeling the stretch in your hip flexors (and sometimes the back).

3. Repeat 3x or as needed.

- Lean back farther to progress the stretch.
- Find the stretch by arching the back rather than twisting it.
- Complete the last stretch below before doing the other side.

FIGURE 11.BREAKOUT.3A

FIGURE 11.BREAKOUT.3B

4. Lat to low back warm-up

Instructions

1. From the last position in the previous hip flexor stretch, inhale, and reach your arm overhead (Figure11.breakout.4a).
2. Extend the arm out from the hip as you reach. This looks like you are swimming in the air (Figure11.breakout.4b).
3. Exhale as you rotate the chest toward the floor while you reach the arm out (Figure11.breakout.4c).
4. Circle your arm down and back up overhead.
5. Repeat 3x or as needed.

Tips

- Keep reaching the arm throughout the stretch for maximal effect.

- Try to get the chest more parallel to floor with each rep.

Repeat entire series from beginning on other side

FIGURE 11.BREAKOUT.4A

FIGURE 11.BREAKOUT.4B

FIGURE 11.BREAKOUT.4C

A complete warm-up before activities like fitness training and sports progress from a 5–10 minute activity like a light jog or stationary bike or full body ROM before progressing to dynamic stretches. Dynamic stretches can be done on the ground and progress to standing with increased tempos and frequencies (repetitions) until one feels sufficiently warmed-up to engage in the intended activity. The person should feel alert, mobile, and ready for high intensity activity. They should not feel tired, relaxed, or too mobile to perform.

Dynamic stretches can also be used to cool down after activity to support a complete and efficient recovery. Tempos are slow so that breathing and duration of stretches are longer to help oxygenate and rehydrate tissues, flush metabolic waste, and restore flexibility. The person is encouraged to keep moving in the stretches to explore various angles in order to individualize the stretch for their specific needs. This protocol will both increase and maintain flexibility and mobility for an active lifestyle.

References

Behm, D. G., Blazevich, A. J., Kay, A. D. and McHugh, M. (2016) 'Acute effects of muscle stretching on physical performance, range of motion, and injury incidence in healthy active individuals: A systematic review.' *Applied Physiology, Nutrition, and Metabolism 41*, 1, 1–11. https://doi.org/10.1139/apnm-2015-0235.

Frederick, A. and Frederick, C. (2017) *Stretch to Win*. 2nd ed. Champaign, IL: Human Kinetics.

Kallerud, H. and Gleeson, N. (2013) 'Effects of stretching on performances involving stretch-shortening cycles.' *Sports Medicine 43*, 8, 733–750. https://doi.org/10.1007/s40279-013-0053-x.

Opplert, J. and Babault, N. (2018) 'Acute effects of dynamic stretching on muscle flexibility and performance: An analysis of the current literature.' *Sports Medicine 48*, 2, 299–325. https://doi.org/10.1007/s40279-017-0797-9.

Sutton, B. (2021) *An explanation of the new updates to the OPT™ model.* Accessed on 03/16/2022 at https://blog.nasm.org/new-opt-model-updates.

References

Brumitt, J. (2015) 'The Bunkie Test: Descriptive Data for a Novel Test of Core Muscular Endurance.' *Rehabilitation Research and Practice 2015*, 1–9. https://doi.org/10.1155/2015/780127

Elphinston, J. (2019) *The power and the grace: A professional's guide to ease and efficiency in functional movement*. Edinburgh: Handspring Publishing.

Frederick, A. and Frederick, C. (2020) *Fascial Stretch Therapy™*. Edinburgh: Handspring Publishing.

Fukashiro, S., Hay, D. C. and Nagano, A. (2006) 'Biomechanical Behavior of Muscle-Tendon Complex during Dynamic Human Movements.' *Journal of Applied Biomechanics 22*, 2, 131–147. https://doi.org/10.1123/jab.22.2.131

Huijing, P. A. (2007) 'Epimuscular myofascial force transmission between antagonistic and synergistic muscles can explain movement limitation in spastic paresis.' *Journal of Electromyography and Kinesiology 17*, 6, 708–724. https://doi.org/10.1016/j.jelekin.2007.02.003

Järvinen, T. A. H., Józsa, L., Kannus, P., Järvinen, T. L. N. and Järvinen, M. (2002) 'Organization and distribution of intramuscular connective tissue in normal and immobilized skeletal muscles. An immunohistochemical, polarization and scanning electron microscopic study.' *Journal of Muscle Research and Cell Motility 23*, 3, 245–254. https://doi.org/10.1023/A:1020904518336

Kram, R. and Dawson, T. J. (1998) 'Energetics and biomechanics of locomotion by red kangaroos (Macropus rufus).' *Comparative Biochemistry and Physiology Part B: Biochemistry and Molecular Biology 120*, 1, 41–49. https://doi.org/10.1016/S0305-0491(98)00022-4

Lesondak, D. (2017) *Fascia: What it is and why it matters*. Edinburgh: Handspring Publishing.

Lesondak, D. and Akey, A. M. (eds) (2020) *Fascia, function, and medical applications*. 1st ed. Boca Raton, FL: CRC Press.

Magnusson, S. P., Langberg, H. and Kjaer, M. (2010) 'The pathogenesis of tendinopathy: Balancing the response to loading.' *Nature Reviews Rheumatology* 6, 5, 262–268. https://doi.org/10.1038/nrrheum.2010.43

Reeves, N. D. (2006) 'Adaptation of the tendon to mechanical usage.' *Journal of Musculoskeletal & Neuronal Interactions* 6, 2, 174–180.

Sawicki, G. S., Lewis, C. L. and Ferris, D. P. (2009) 'It pays to have a spring in your step.' *Exercise and Sport Sciences Reviews 37*, 3, 130–138. https://doi.org/10.1097/JES.0b013e31819c2df6

Schleip, R., Baker, A. and Avison, J. (eds) (2015) *Fascia in sport and movement*. Edinburgh: Handspring Publishing.

Solnit, R. (2017) *A Field Guide to Getting Lost*. Edinburgh: Canongate Books.

van Pletzen, D. and Venter, R. E. (2012) 'The relationship between the Bunkie-test and physical performance in Rugby Union players.' *International Journal of Sports Science & Coaching 7*, 3, 543–553. https://doi.org/10.1260/1747-9541.7.3.543

Further reading

Alexander, C., Ishikawa, S. and Silverstein, M. (1977) *A Pattern Language: Towns, buildings, construction*. Oxford: Oxford University Press.

Anderson, B. (1981) Flexibility testing. *NSCA Journal 3*, 2, 20–23.

Baechle, T. R. (1994) 'Neuromuscular adaptations to conditioning.' In *Essentials of Strength Training and Conditioning*. Champaign, IL: Human Kinetics.

Barker, V. (1993) *Posture Makes Perfect*. Tokyo: Japan Publications.

Lesondak, D. (2017) *Fascia: What it is and why it matters*. Edinburgh: Handspring Publishing.

Trabold, O., Wagner, S., Wicke, C., Scheuenstuhl, H. *et al.* (2003) 'Lactate and oxygen constitute a fundamental regulatory mechanism in wound healing.' *Wound Repair and Regeneration 11*, 6, 504–509. https://doi.org/10.1046/j.1524-475X.2003.11621.x