This led me to develop a model to account for what I was seeing (see Figure 1). The two left quadrants of the model represent the typical pre-Rolfing client, who has tissue restrictions that we Rolfers are well-trained to help them resolve. In the case of clients who are in the lower left quadrant, they are both restricted and do not have the tissue strength (tonus) needed to hold themselves up. They can't maintain their Line, and when faced with the continual demands of life – like sitting in front of a computer – they adapt to the 'computer posture.' With the help of Rolfing SI they move into the lower right quadrant, 'unrestricted/unsupported.' CrossFit type exercise can help these clients get stronger so they can move up into the 'unrestricted/supported' quadrant.

Clients who are in the upper left quadrant are restricted but strong enough to be able to hold themselves when the restrictions are removed; they move into the 'unrestricted/supported' quadrant. These clients may not see much change from the Rolfing experience with regards to posture, but they will experience a benefit in their work capacity and the freedom of movement that Rolfing SI provides. These clients are normally already involved in some type of athletic endeavor: weightlifting, or sport that requires the generation of power. However, the exercise may not be functional in nature.

The test for whether the exercise workout will cause an adaptive change is summed up by these three questions

1. Are the movements functional, requiring the use of multiple joints and fascial planes?
2. Are they varied in the movements required, requiring the nervous system to learn?
3. Are they intense relative to the person's current fitness level, requiring tissue adaptation and nervous system adaptation?

If the answer to any of these questions is no, then the workout will not cause positive long-term adaptation.

We often have people come in to try CrossFit who consider themselves to be in very good condition: runners, cyclists, even triathletes. They are amazed when we suggest a scaling of the intensity of the workout for them and then grateful that we did. Their difficulty with the workout comes in two physiological areas – absolute strength and, amazingly, cardio-respiratory endurance – as well as in an increase in intensity that long, slow distance does not prepare them for. But it is exactly this intensity that sets up the need for the body to adapt.

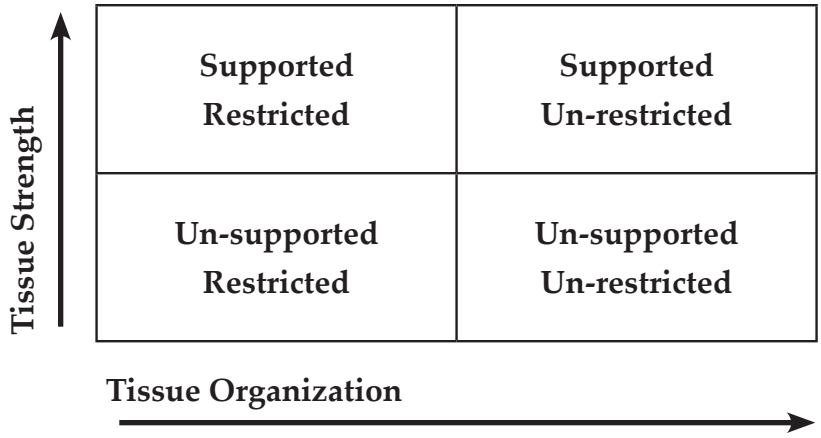

Figure 1: A model for client evaluation.

If you're finding that your clients are not able to win in their battle with time in a sitting position, they may benefit from functional fitness like CrossFit.

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S-T-R-E-T-C-H-I-N-G

By Michael Reams, Certified Advanced Rolfer™

"Common wisdom is generally neither common nor wise."

John Kenneth Galbraith[1]

"Justifying improved practice on scientific evidence is a dynamic process. With new evidence, the foundation will change…. Be prepared to challenge current thoughts and rethink currently accepted practices."

Stuart McGill[2]

"Stretch before workout/competing . . . Stretch after workout . . . Stretch between sets . . . Stretching is the best workout and you don't need to do anything else . . . Stretch as soon as you get up in the morning . . . Sit-ups over a ball are best for your abs and back . . . "Flatten that lumbar spine" . . . and the list goes on. Many of these suggestions are part of a gym/training mythology, and frequently have either a thin or completely non-existent scientific basis.

Over the past several years, there has been an increasing level of controversy regarding stretching and its role in health, athletics, rehabilitation, and back health. A survey of the mountainous volume of information being purveyed in books, training manuals, gym/fitness facilities, in magazines, and on the web is amazing and frequently conflicting. As a coach, trainer, or Rolfer, in whatever capacity you deal with people and their physical process, the bottom line always is to do no harm. The following is a presentation of what I have learned in the process of exploring stretching and flexibility in my practice and trying to maintain a scientific basis, the most up-to-date information available.

To provide a common language and understanding of the following information, a few definitions are in order:

Flexibility: "A primary function of muscles is to create tension and produce force for movement of the body's skeleton system. The intrinsic property of muscles and joints to go through a full or optimal range of motion is referred to as flexibility."[3]

Static Flexibility "is the range of possible movement about a joint and its surrounding muscles during a passive movement. Static flexibility requires no voluntary muscular activity."[4]

Mobility/Dynamic Flexibility: The ability to move joints through a range of motion during active movement with strength as a key component requiring voluntary muscle activity.

Core: According to Core Therapeutics in Bellingham, WA, "the core is way more than abs, it is any three-dimensional intersection across the spine at any level, in all directions." Some coaches and trainers note that many of the common definitions of "core" continue the misconception that the body segments are separate and can/should be trained separately. This segment of the training community generally agrees that the "core" is continuous from the soles of the feet to the top of the head and ends of the fingers.

The controversial issues with flexibility/stretching include injury avoidance, muscle soreness prevention, muscular strength training, performance improvement, and reduction or prevention of low back pain. With the volume of studies conducted in these areas over the past several years, I have made an effort to review academic/scientific literature to provide an overview of both general and view-specific peer-reviewed articles. In some cases I have drawn directly from published information.

Injury Prevention

The Australian Military did some of the first studies regarding stretching and injury prevention.[5] While there are some noted flaws in the study, the results surprised the training world. Stretching prior to training did not reduce or prevent injuries. This prompted additional inquiries that also tried to correct for the errors in the initial studies. Rather than studying the limited profile provided by military recruits, the studies expanded to both recreational and elite athletes and includes a much broader age range. In another randomized, controlled trial, Dutch scientists found that warming up and stretching did not reduce the risk of injury in 421 recreational runners. During the sixteen-week study, there were 5.5 injuries per 1,000 hours of running in those who stretched before exercise, and 4.9 injuries per 1,000 hours of running in those who did not stretch before exercise.[6]

The summary of all of these studies concludes: pre-exercise stretching does not prevent injury in competitive or recreational athletes. There are some areas that warrant further investigation. Some propose that pre-exercise stretching causes an alteration in joint connective tissue to extend appropriately in response to applied pressure. It has been suggested that stretching might prevent injuries in sport involving jumping and bouncing, such as soccer and basketball. This would seem to be the case if 'stretchy' muscle were better able to absorb energy. However, it has in fact been shown that less force is required to rupture 'stretchy' muscle than 'stiff' muscle.[7] Pavel Tsatsouline has also proposed that when there is a difference between the active range of motion (mobility) and the passive range of motion, that can be where injuries occur, that is, as the person moves from the active range of motion to the passive range of motion during a maximal effort. Think of the 100-meter runner who, in the extra effort of competition, extends the driving leg from the strength range into the passive range which is not strong enough for the power load, then tears a hamstring.

Performance

"The relationship between static and dynamic ROM is unresolved; therefore, the direct transfer between measures of static flexibility and sport performance cannot be determined."[8] From the National Strength and Conditioning Association's text *The Essentials of Strength Training and Conditioning* comes the following summary of stretching during warm-up: "There is little, if any evidence that stretching pre or post participation prevents injury or subsequent muscle soreness . . . static stretching can compromise muscle performance."[9] Although some studies demonstrated that static stretching had no effect on subsequent performance, static stretching has been shown to lead to a decrease in force production, power performance, running speed, reaction and movement time, and strength endurance. Additionally, both proprioceptive neuromuscular facilitation (PNF) stretching and ballistic stretching have been shown to be detrimental to subsequent performance. Dynamic stretching, however, does not seem to elicit the performance-reduction effects of static and PNF stretching and has been shown to improve subsequent running performance.[10] A recent study, of elite rhythmic gymnasts found that while vertical-jump flight time was not affected by static stretching, the ground-contact time of the hopping test was significantly increased.[11] Also, static stretching significantly reduced the flight time of the technical leap. Since flight time was the main predictor of scores of the three technical leaps, static stretching significantly reduced the scores awarded by the judges. "This study suggests that SS (static stretching) before leaping performance may negatively affect rhythmic gymnastics judges' evaluation."[12]

The studies regarding stretching before a performance requiring strength demonstrate a strength reduction of 4.5% to as much as 28%. "Remember that high performance is not a stretching contest. Mobility is a requirement, but loose joints without precisely controlled strength are unstable. This decreases performance and increases the risk of subsequent injury."[13] A study of soccer players comparing static stretching with an active warm-up and active warm-up with dynamic stretching demonstrated that sprint and agility times were significantly slower with static stretching. The conclusion of the report is: "We recommend for optimal performance, specific dynamic stretches be employed as part of a warm-up, rather than the traditional static stretches."[14,15] A reduction in strength or performance is clearly not what most people are looking for be they athlete, laborer, or weekend gardener.

Why is Pre-exercise Stretching Detrimental to Performance?

Two mechanisms may explain why pre-exercise stretching is detrimental to performance. Firstly, stretching damages the contractile proteins in skeletal muscle. Secondly, stretching reduces one's ability to recruit skeletal muscle.

"Skeletal muscle contains thick filaments and thin filaments that are connected by cross-bridges. When a nerve signal reaches

the muscles, the thin filaments slide over the thick filaments. However, movement cannot occur if the cross-bridges between the filaments are broken. Indeed, animal studies have shown that force production is reduced when muscle filaments are stretched beyond overlap. Animal studies have also shown that cross-bridges are broken when muscle is stretched only 20% beyond its resting length. In humans, there is evidence of muscle damage hours after a bout of stretching, which has led scientists to conclude that stretching causes delayed-onset muscle soreness.

The nerve signals that initiate muscle contraction are electrical in nature. Thus, electrodes can be used to monitor muscle activity. In humans, such studies have shown that muscle activity and force production are reduced after stretching. These findings suggest that stretching produces some kind of neural inhibition that is detrimental to performance. This hypothesis is supported by a study showing that balance and reaction time are also impaired after static stretching."[16]

Additionally, other hypotheses can be found to explain the reduction in muscle strength when preceded by stretching exercises. Avela et al. found a decrease in the sensitivity of muscle spindles, leading to a reduction in the activity of the large-diameter afferents, along with alpha motor neuron inhibition produced by Type III and IV joint receptors, which decreased by 23.2% the MVC (maximum voluntary contraction) in triceps surae muscle. Changes in the visco-elastic properties of the muscle-tendinous unit reduce passive tension and stiffness. Because one of the roles of the tendon is to transfer the force produced by the skeletal musculature to bones and joints, a less stiff muscle-tendinous unit will transfer the changes in the musculature less effectively. Such visco-elastic alterations may place the contractile elements in a less favorable position regarding the force output in the length-tension relationship and force-velocity curves, which results in a delay of the transmission of force from the muscle to the skeletal system. The study concludes with: "Strength and conditioning professionals may want to consider avoiding PNF stretching before activities requiring local muscular endurance performance."[17]

Dr. Ben Benjamin presents another explanation regarding why long periods of static stretching (sixty seconds), contrary to popular opinion, are problematic and do not yield the expected results.[18] He states that "prolonged stretching initiates the myotatic reflex (commonly referred to as the stretch reflex) – a defensive mechanism that is designed to prevent muscles from stretching too far. In response, the muscle reflexively contracts, which is the opposite of what you want to happen. Static stretching also decreases blood flow within the tissue and leads to a buildup of waste products, such as lactic acid, that contribute to muscle fatigue and soreness. As a result, the tendons and ligaments may get stretched more than the muscles, which can lead to tendon irritation or injury and even ligament laxity, thus predispose [sic] the structures to future injury." While there are many theories regarding the rising increase in ACL injuries in young female soccer players, the static stretching of the hamstrings, a major stabilizer of the ACL, prior to practice or a game may be a major contributor. Also indicated in ACL injuries is a lack of connection, stability and strength between the upper body and lower body, which, when added to an already weakened hamstring increases the risk of ACL injuries.[19]

An important lesson from the previous two sections for Rolfers to consider is how to maintain the health of their shoulder girdles. Solely stretching the shoulder girdle will most likely on a long-term basis increase shoulder problems and decrease one's occupational longevity. Building strength through ranges of motion and developing a strong, balanced shoulder girdle will provide better shoulder health and longevity. Exercises such as kettlebell overhead presses, arm bars, and high bridge Turkish get ups will provide strength and range of motion.

Stretching/Strengthening the Low Back

The following information comes directly from the publications of Stuart McGill, Ph.D., University of Waterloo, Ontario, who is one of the world's leading researchers of spinal mechanics and spinal health. McGill gives seminars worldwide and has had significant impact on industrial/labor standards for back health as well as rehabilitation and corrective exercise programs. To get the complete understanding of his perspective and research regarding back disorders I encourage you to read his material and, if possible, attend one of his seminars. I have found his information and perspectives helpful in my practice as both a Rolfer and a strength coach.

"..the intervertebral discs are highly hydrated upon rising from bed; the annulus is subjected to much higher stresses during bending under these conditions. The end plates fail at lower compressive loads as well. Thus, performing the spine-bending maneuvers at this time of day is unwise. Because the discs generally lose 90% of the fluid they will lose over the course of a day within the first hour after rising from bed, we suggest simply avoiding this period for exercise (that is bending exercise) either for rehabilitation or performance training.[20]

In addition, Dr. McGill goes on to explain:

> Name a study that has shown that working to increase back flexibility has increased performance. I have not been able to find one despite people calling this so. Studies of weightlifters have shown those with more flexibility tend to be the better performers but this is specific to the shoulders and hips – not the back. Power, as in most sports, comes form the hips and legs, not the back. Cross-sectional studies of some team sports have shown that the higher performing athletes are, in many cases, the "tighter" ones! For example, despite the widely held notion that many athletes should be lengthening hamstrings, it is curious that the better performers (such as basketballers) appear to be the ones with 'tight' hamstrings. They are "wound like springs" and take full advantage of this. Further, hamstrings contribute shearing stability to the knee such that lengthening them has been reported to be associated with elevated disruption of the anterior cruciate ligament. No wonder the bulk of the literature has shown no link between hamstring tightness and back pain, either current pain or predicting future pain.[21]

Dr. McGill goes on to explain that back flexibility training is prescriptive on an individual basis but is not the general prescriptive requirement to rehabilitate a bad back nor to maintain good back health. "But, strength endurance training is necessary for both rehabilitation and healthy back maintenance."[22]

In conclusion, the commonly assumed wisdom and perception of stretching as a panacea for pain and injury reduction, back health issue, and performance improvement, does not meet scientific reality. Dynamic warm-ups and strength building using ranges of motion, as well as whole body exercises that connect and work through the whole body to develop mobility and functional ranges of motion, will substantially contribute to function, performance and injury reduction.

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Rolfing® SI with a Twist

Yoga Positioning for Advanced Sessions

By Karin Edwards Wagner, Certified Rolfer™

Introduction

In the classic Rolfing® Structural Integration (SI) Ten Series, practitioners work with clients in set positions – supine, sidelying, prone, and seated – as prescribed by the 'Recipe.' In the original advanced series, there were again set positions (e.g., 'Inverted A,' 'C Curl,' and 'Z Position') designed to support the goals of the particular session. It's also possible to work with clients in other positions – in this case, positions inspired by yoga *asanas* – to accomplish advanced goals. These goals include support, adaptability, span and spaciousness (i.e. palintonicity), balance, and perception.

Often, the full asana is too complex or too challenging to allow me to do my work. By deconstructing the pose, I can address one aspect of it at a time. Reducing the challenge level of the pose also creates softness in the body so that my client can better receive work in the area in question. An electric lift table that goes through a large range of heights is a very helpful tool. Versatile table height allows me to support my client in a partial version of the asana. If you don't have an electric lift table, it's possible to improvise using props and pillows.

This approach works well for guiding sessions eight through ten and also for 'post-Ten' work. As session eight approaches, I ask clients who practice yoga to reflect on their yoga practice to identify several poses