Range of Motion Conditioning Just for Kicks

By Nick Lee

Introduction

Range of Motion (ROM) suddenly comes into sharp focus when you begin training Taekwon-Do. Whether you aspire to become an elite practitioner or, like me, just want to be able to improve your execution of Taekwon-Do techniques to a proficient level. Developing specific strength and flexibility, especially in the lower body, is key to achieving the extended ROM and coordination required for Taekwon-Do kicks.

For most of us who are not elite practitioners, our Range of Motion (ROM) at our hips ideally still needs to be developed to above average[1] for us to be able to execute our techniques with a reasonable level of proficiency. More importantly, we need extended ROM to prevent us from injuring ourselves when training or when using our techniques.

As one who has always had to work at maintaining only an average level of flexibility, I often get frustrated at the ease with which some people seem able to attain ROM or are naturally flexible and therefore seem able to execute Taekwon-Do Middle and High kicks with ease. The fact is, some people's body type, composition and bone structures, give them some advantages when it comes to flexibility and ROM. However, the bottom line is - anyone who wants to perform Taekwon-Do kicks and techniques to a high standard needs to work hard at specifically conditioning themselves to do so.

Conditioning your ROM for Taekwon-Do kicks is all about developing strength and flexibility, primarily to maximize your active ROM at the hip joint(s).

I know I'm not the only one who is challenged when it comes to improving their kicks. So for those of you who are like me, I hope the next couple of pages may give you some additional information and ideas that you can add to your own Taekwon-Do training and overall health and fitness.

[1] Appendix 2: Thomas Kurz – Normal Active ROM

Health & Safety Note: No Pain No Gain?

"No pain no gain" or my personal favourite, "Pain is just weakness leaving the body" are common phrases heard in the fitness industry.

I'm a firm believer in the benefits of pushing yourself hard to constantly test and extend your limits and using intensity to maximize training effects on the body. However, it is important to distinguish between "good" pain and "bad" pain. In general the golden rule is "Form is Everything" (alignment of your body to maximize biomechanical efficiency) no matter what movement, exercise, stretch or activity you are engaged in. Provided your movement is sound (if you are not sure have a professional or someone who is experienced with a given movement check you out) then the fatigue or pain you feel is in general "good" pain. Often, as anyone who has pushed their own physical limits will relate to, 24-48 hours post workout you will often get Delayed Onset of Muscle Soreness (DOMS) which is an unpleasant but acceptable side effect of training hard and the process of soft tissue adaption.

However, when specifically stretching to improve your ROM, "feeling the stretch", should not equate to gritting your teeth to achieve tissue tearing dominance over your nervous system. I have certainly been guilty of this in the past, to force myself closer to achieving front and or side splits. In my experience, forcing yourself despite "bad" pain is counter-productive and at worst you will injure yourself. Everyone's tolerance to pain is different so it is a personal judgement based on your own experience as to how far to push yourself.

Always warm-up using dynamic movements (preferably using movements, well within your ROM limits, and ideally similar to the movements, activity, or skill you are about to perform). You should always be warmed-up before undertaking static stretching techniques[2]. Unless you can relax the muscles you are stretching and breathe normally during any stretch, then you are unduly forcing your body and risking an injury.

Similarly, you should also be able to contract[3] the muscles you are stretching. If you have reached the point where you cannot contract them, generally your body's Stretch Reflex[4] will be progressively indicating that your soft tissue muscle fibres are being challenged beyond their norm – that indication will be pain.

Any level of Joint Pain when stretching is never "good" pain (for example knee pain when squatting). Joint Pain can be the result of several different causes and often a combination of more than one of the following:

- Injury to the joint bone surfaces and/or surrounding soft tissue (cartilage, ligaments, tendons) be that chronic or acute. Acute injuries from impact or overload forces are generally obvious and may or may not result in permanent joint and or soft tissue damage and movement restrictions depending on severity and rehabilitation efforts. However, what is less understood is that poor form

[2] Ref Appendix 7
[3] Refer Appendix 1: Definition of Terms
[4] Refer Appendix 1: Definition of Terms

(how you are moving or your posture on a day today basis) may be putting undue stress on certain joints. Poor movement mechanics will lead to joint damage over time especially if the joint is load bearing and the poor movement is repetitive, for example, when running, walking, bending, jumping etc. The risk is higher the more load or weight you add to your body be it excess body weight or external loads.

- Tight and or muscle imbalances.[5] This will often refer pain to the joint(s).
- Deterioration of the joint structure. This could be from injury or joint disorder, arthritis (osteoarthritis, rheumatoid), calcification (bone spurs).
- Genetic structures such as deep hip sockets may mean some "normal" range movements are not biomechanically feasible. Trying to push beyond the range of your joint structure will cause pain. If you are concerned that this is a factor for you, consult a healthcare professional who may recommend an X-ray to provide a definitive answer.

[5] Refer Myofascial Release – "Pain in the Web"

Range of Motion (ROM)

> **"Range of motion exercise** refers to activity aimed at improving **movement** of a specific joint. This **motion** is influenced by several structures: configuration of bone surfaces within the joint, joint capsule, ligaments, tendons, and muscles acting on the joint." - (medical-**dictionary**.thefree**dictionary**.com)

For all of us, whether we realise it or not, maintaining a *good* [6]range of motion in all our joints is fundamental to our quality of life, especially as we age.

As a population in the developed world, our drive for convenience has brought us to the point that our day to day survival is not dependent on our ability to move well - we don't need to hunt down our prey by running it down or climb a tree to evade our predators. For many people now, the opposite end of the movement spectrum applies. We don't move much at all! Work and leisure activities and life in general involves a lot of sitting around, often for hours at a time. Habitually doing anything will have a conditioning effect (good or bad) on our bodies. For this very reason the activity of sitting has been the focus of quite a bit of research in recent years and is now thought to have wide reaching negative impacts on our health in general.

The bottom line is, avoid sitting for extended periods of time. It would seem even if you do some corrective exercise to counter the bad effects of sitting for lengthy periods, this is not enough, and there is still a correlation between time spent sitting and reduced longevity! The old saying of "use it or lose it" sums it up perfectly.

We all should move our bodies and limbs into as many different positions as we can achieve on a regular basis. That's not to say everyone should strive to be Yogi's or contortionists, but we could all benefit from moving our limbs and bodies more often and into positions beyond those habitually required.

In our Western culture "play" is for kids and a sign of maturity is conforming (confining) our physical behavior or activity to social norms like wearing shoes, and sitting at a table to eat or restraining the urge to cartwheel down the office corridor when you get a pay rise etc. Once upon a time "play" generally meant doing something physical even if it was with your imaginary friend but these days it more likely means changing from one screen to another screen!

From a general health perspective, there is now consensus that good nutrition, hydration, exercise and sleep are key to balancing out the excesses of our contemporary lifestyles. Ongoing research and arguments abound as to the optimal type and quantities of each of these components for general good health and wellbeing, to achieve maximal performance in the sporting arena or at any elite physical performance level.

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[6] Refer Appendix 2: Thomas Kurz – Normal Active ROM

For the purposes of this discussion I want to limit the focus to movement and training techniques associated with conditioning Range of Motion (ROM) specifically at the hip joints which are the key enablers to training effective Taekwon-Do kicks. The same principles and similar techniques apply to all joints and improving ROM generally.

What is considered "Normal" Active hip ROM?[7]

According to Kurz (Thomas Kurz – Stretching Scientifically)

Flexion: 110-130 degrees (Flex knee and bring thigh close to abdomen.)

Extension: 30 degrees (Move thigh backward without moving the pelvis.)

Abduction: 45-50 degrees (Swing thigh away from midline.)
Adduction: 20-30 degrees (Bring thigh toward and across midline.)

External rotation: 45 degrees **(**Flex knee and swing lower leg toward midline.)
Internal rotation: 40 degrees (Flex knee and swing lower leg away from midline.)

In Taekwon-Do our kicks are a signature feature of our art and yet, despite training and stretching, many find it a challenge to develop and maintain sufficient range of motion to enable the execution of "middle" let alone "high" kicks.

For martial artists in general and Taekwon-Do practitioners especially, maximizing and maintaining hip range of motion is a fundamental enabler[8] and needs to be an ongoing focus of training and conditioning. To execute middle and high kicks effectively we need substantially more useable hip ROM than these "Normal" or "Average" figures (above).

How much ROM is enough? Well, provided you are moving within the limits of your joint bone structures and not over stretching (damaging) tendons and ligaments, then as far as soft tissue strength and flexibility is concerned the more ROM the better! How much you need depends on the skills or movements you want to be able to undertake. If you want to perform Taekwon-do kicks at an elite level, then once again, the more ROM at your hips, the better.

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[7] Active ROM – The "normal" values quoted above by Kurz are based on the test group's ability to actively move their leg(s) into the "test positions" as opposed to being moved by someone or some external force. The latter would be a measure of "passive ROM" and in general is greater due to neural, muscle and soft tissue restrictions being less as the individual is relaxed and not "activating" his/her muscles.

[8] Maximising hip range of motion (ROM) does not guarantee you will have good kicks but it is a necessary pre-requisite if you want to be able to execute middle and or high kicks effectively and safely (without injuring yourself).

A practical measure of the required hip mobility for Taekwon-Do kicks is the ability to do both, side and front splits and move dynamically into and out of them.

In my view as Taekwon-Do students and practitioners, full splits (side and open front and full front) should be the goal which we should all work toward gaining and then maintaining.[9] Most people's hip ROM is limited more by their neural programming and not so much the soft tissues, muscles and fascia acting to move the joint. To "test yourself" Refer Thomas Kurtz (Fighting Arts Article).[10]

As such, with appropriate conditioning hip ROM can be increased dramatically beyond the charted "normative" values.

Age does not preclude this goal although if, like me, you are starting later in life and you have not previously used this extended ROM then, as I'm finding, it will just take a little longer and a little more effort to get there. For me, the ultimate would be to comfortably execute active front and side splits without needing to warm up.

For simplicity and to illustrate conditioning techniques and principles, I will focus this discussion on hip ROM and anatomy. In practice there are other critical joints and anatomy involved - for example, Spinal saggital plane (forward/backward) flexion/extension and lateral spinal flexion (side bending) are also involved in doing the splits.

Extended ROM Conditioning

Increasing your active ROM at any joint is a matter of conditioning to enable the muscle fibers and fascia (the "web" of connective tissue surrounding our muscles) that integrate to operate on that joint to fully contract and fully release to their maximum potential.

For you to actively move any joint, in simplistic terms, requires some muscles to contract (agonist) and some muscles to release or relax (antagonists). The mechanism that enables this to take place, in a coordinated manner, is complex but a component of this mechanism is termed Reciprocal Inhibition.[11]

We (the human body) also have an inbuilt safety mechanism that protects muscles and soft tissue but inhibits joint ROM by sensing muscle contraction strength and length. When this is triggered the result is inhibition of further release of the muscle(s) being stretched and pain from the stretching muscle being felt. This mechanism is termed the Stretch Reflex. [12] Both these mechanisms are autonomous neural functions.

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[9] Hip joint bone structures (Femur, Pelvis) vary for individuals and some people's joint structures (typically those few who have "deep" hip-sockets) may restrict their hip ROM such that full splits, especially side-splits are unachievable.

[10] Appendix 8: Thomas Kurz – ROM test

[11] Refer appendix 1: Definition of Terms

[12] Refer appendix 1: Definition of Terms

While not fully understood yet, these mechanisms, along with other autonomous neural programs, appear to be the major determinants of muscle tension and therefore overall ROM rather than the physical soft tissue "length" and/or other physical tissue adaptions.

There is a large volume of literature about flexibility and stretching and the relative pros and cons of the different types of stretching regarding their effect on ROM, some of which is contradictory, and much of which are opinions (re)promulgated as fact but not actually supported by scientific research. I've chosen my sources for the principles and techniques involved based on what I've found makes sense to me and to be useful for my own purposes.

To date,[13] I have been most influenced in my strength and flexibility thinking and training practice by the principles and techniques developed by three individuals whose work and ideas are, in my opinion, worthy of your further scrutiny. I would recommend their books and material to anyone interested in strength and flexibility especially for martial arts:

- Thomas Kurz – 'Stretching Scientifically: a guide to flexibility' (first published 1987 – currently 4th edition 2003)
- Pavel Tsatsouline (Sat-Soo-Lin) 'Relax into Stretch'
- Paul Ziachik – 'Elasticsteel' and 'EasyFlexibility'

Thomas Kurz's book 'Stretching Scientifically: A guide to flexibility' is the first comprehensive book I read on the topic of flexibility and is well researched. It is a great overall resource on the topic of training strength and flexibility for sport and especially martial-arts. His old Eastern Bloc (pre-USSR) methodology for improving ROM strength and flexibility primarily uses Isometric contractions in conjunction with static passive stretching. He sums it up simply in an introductory paragraph at the opening of his book:

> "*Tense your muscles prior to relaxing and stretching them, and tense them every time when you want to increase your range of motion during a stretch. To simultaneously develop strength and flexibility, tense your muscles while they are fully stretched. As your strength in stretched positions increases, so does your range of motion and your ability to use increasingly greater range of motion without a warm up.*"

Pavel Tsatsouline – Is originally from Belarus and is an ex-military Spetsnaz PE trainer now living in the US and credited with introducing the Russian Kettlebell to the US. He also is an advocate of the "Old Russian" methodologies but draws from Yoga and other disciplines as well. His philosophy is "Strong First" and he has recently changed his business brand to exactly that. He has written several books and runs seminars and workshops on a variety of strength and tactical training aspects.

[13] My research and learning is an ongoing journey and, as always, I don't know what I don't know.

If you are interested in strength training but haven't used Kettlebells yet, or if you have but haven't heard of Pavel, then I strongly recommend you invest some time in discovering what his methods and training with Kettlebells can offer your overall health & fitness. Pavel says:

> "*Tension and power are the same thing. There are two ways of gaining strength. Simply build yourself a bigger muscle, or learn to contract the muscle that you already have even harder.*"

Pavel's core philosophy is based around the latter. He has a term called "Irradiation" which he uses to describe how the body generates maximal tension (power) from three central areas: The Fist(s), Abdominals (maximized through intra-abdominal pressure) and Glutes[14]. His strength training methods focus on maximal contraction speed and intensity, low repetitions (3-5) and never pushing until the muscle completely fatigues. He continues:

> "*What really prevents all of us from being flexible has nothing to do with "short" muscles, it's the nervous system.*
>
> *The fear of injuring yourself fires up your nervous system to tense up your muscle. The muscles tighten up and resist lengthening. Russian scientists call it antagonist passive insufficiency.*
>
> *It's the programming or the software (nervous system) that is preventing you from doing the splits, not so much the hardware (muscles).*
>
> *The key is for us to learn how to 'hack' the programming of our nervous system. We need to learn to override it and learn to relax the muscle into the stretch. Human muscles are designed to be long enough to do all of the flexible movement including the splits.*"

Pavel's approach to flexibility is not to stretch, but to relax using the breath, and to control the nervous system response (stretch reflex) by manipulating tension and breathing. He has another term called "Prying" which he coaches as essentially micro movements or "shifting around" while in extended range positions to create space and then move deeper into a given static position while exhaling deeply to completely release intrabdominal pressure.

[14] All the gluteal muscle group.

Paul Zaichik has come onto the scene more recently and is a kinesiologist with a martial arts background.

Consistent with both Kurz and Pavel he advocates extended range strength as the key to gaining and maintaining active ROM. However, he employs a two-step approach:

1. Target the weakest (which will be the “tightest’) muscle(s) to gain ROM.
2. Train functional strength in extended ROM.

His strategy to overcome the Stretch Reflex takes advantage of the fact that all muscles have more than one function or direction of contractile action.

The methodology Zaichik uses, is to focus on specific movements for individual muscles or groups of muscles that have similar actions and use one action as a “lever” to create “space” for the other action or “Target”. Once you have programmed your body to get into extended positions then you focus on strengthening and moving in those ranges. To maximize ROM gains using his techniques, Zaichik also advocates self-massage or Myofascial Release techniques.[15]

Zaichik has packaged different combinations of these systems as sequenced programs associated with the skills or activities you are interested in conditioning be it martial arts kicking, ballet, yoga, or more.

[15] Refer to Appendix 6: Myofascial Release & Trigger Points

My Extended ROM Journey, So Far

In my quest to extend my own hip ROM I've explored each of Kurz, Pavel and now Ziachik's methodologies as I've discussed above. Each have their merits and I've learned something from all of them as far as my own training and knowledge.

When it comes to strength training, I like Pavel's ideas and approach (I also like his Russian bloke humour). Working as a Personal Trainer I use a lot of Pavel's kettlebell exercises and strength techniques which absolutely do work for both strength and ROM. The functional strength exercises he advocates like Deep Squats, Cossacks, Pistol Squats, Turkish-get-ups and Windmills demand full range[16] motions.

I have gained some improvement in hip ROM while using Pavel's techniques which has no doubt helped my kicks. However, as much as I enjoy his strength training methods, I have not mastered his "forced relaxation" breathing technique to the extent necessary to achieve the splits. I would have to add the rider that I haven't persevered because the pain/gain ratio was too High/Low for me.

Having said this, I do subscribe to Pavel's view that our muscles and fascia already have sufficient length to make use of the full ROM that our joints are capable of and it is primarily our "software" or nervous system that prevents us from doing so.

Paul Zaichik's kinesiological approach based on understanding individual muscle actions for a given ROM has been enlightening and renewed my enthusiasm to refocus on improving my own ROM.

I first chanced upon Zaichik's material on the internet several years ago and initially dismissed him (his early videos were dodgy looking martial arts material filmed in what looked like his bedroom). However, after experimentation with some of the sample movements and ideas he has more recently published and advertised on his YouTube channel(s) I took a longer look. Earlier this year I completed his online certification course to learn more about his techniques and to make use of them for myself and my students and PT clients.

Considering the individual methodologies and approaches that Kurz, Pavel and Zaichik are having success with, and my own training experience using their ideas, I think the following three components combine to improve ROM:

- Target and strengthen the weakest muscles first
- Focus on strength at extended length
- Continually rebalance tension in your soft tissue using massage.

[16] Full use of normal ROM – Refer Appendix 2: Normal Active ROM

Targeting the Weakest Link

The rationale for targeting specific muscles and specific movements is simple - focus on the weakest link within the muscle group as this will be the barrier to the overall ROM in that direction. The muscle with pain will be the weakest and therefore the one triggering the Stretch Reflex and inhibiting further movement in that direction.

To illustrate the approach and for simplicity in this discussion I have chosen to only focus on the Side Split application and the Adductor Muscles that need to lengthen. I have included the full anatomy of the Side Splits[17] however for context.

You may have been using the classic static seated straddle stretch as a general adductor (inside thigh) stretch to improve your ROM toward a side split but, like me, cannot seem to progress beyond a certain point before pain kicks in and inhibits further ROM.

As you can see, in this stretch the Hamstrings need to extend as well and there are the Agonists muscles that need to contract to enable you to achieve an active Side Split. Once again the extent to which you have full range contractile strength in these agonists will play an equally important role in your ability to achieve the splits and more importantly use this ROM functionally.

Appendix 3 - Figs 2-3 show the six Adductor muscles all of which adduct the hip but only two, Gracilis and Pectineus also internally rotate the hip. The simple static straddle stretch focuses primarily on abducting the hip and does not fully stretch the Pectineus and Gracilis and therefore a different movement or position is required to target them.

Zaichik has developed systems for all the major joint movements which involve specific postures, and movements in these postures, which allow the leveraging and targeting motions to be undertaken by an individual without assistance.

Occasionally the use of a Band or Strap, Yoga block or similar is required, however the "systems" are designed with the following principles in mind:

- Allow an individual to perform them on their own without assistance
- Enable both "Leverage" and "Target" movements
- Use strong muscles to perform Leverage and gravity to aid Target movement
- In most cases Leverage and Target movements can be reversed.

The reason that Stretch Reflex is not triggered is because neither the Target or Leverage action is held for more than two seconds. By using combinations and variations of repetitions of the systems in a sequenced program, and multiple Leverage and Target "reps" and "sets" within and of each system, you progressively increase your work load and ROM.

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[17] Refer to Side Split Anatomy Appendix 3

I can vouch for the fact that by the end of the third round or circuit of any of Zaichik's programs you will feel like you have worked hard because the programs are more like mobilising exercises than stretches as you are not triggering the Stretch Reflex.

While the normal application of the systems does not employ static hold, relax, or isometric contractions, these are options that can be incorporated if you choose. Generally, after completing a given program of these systems some static relaxed time spent in, for example, your new widest Side Split helps your Nervous System normalise the new ROM.

Once you get the feel of the action on the target muscles, it comes down to personal preference and what works for you. For instance, incorporating isometric contraction of the target will benefit extended range strengthening of the targeted muscle and enable quicker overall gains in ROM.

Extended Length Strength

Strength is the most important component in determining your useable ROM.

Kurz, Tsatsouline and Zaichik all emphasize this, and the key is developing strength in deep or extended positions that allows you to make these positions functional for yourself.

Zaichik has put together both general and specific extended range conditioning exercise programs[18] which ideally you do immediately following the stretching program to reinforce the gains in ROM you have just created. Zaichik makes use of full body complex movements to focus on extended length. He includes yoga type postures, positions and movements that require balance and both eccentric and concentric contraction[19].

In general, Zaichik's exercises focus on full range movement and balancing in lengthened muscle and extended joint angle positions to re-programme the nervous system to your new "normal" and develop motor neuron recruitment to support these positions and motions.

Some of what we already do in the Do-Jang is obviously very useful in achieving this - my only caution would be to not confuse extended range strength training with ballistic movements such as throwing your kicks higher in your patterns or line work or even at the pads.

Specific drills however like multiple side and turning kick motions with your knee kept as high as you can keep it especially when done slowly[20]for example, are very good exercise to develop extended range strength for the specific muscles required.

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[18] Refer Appendix 5: Extended Length Conditioning

[19] Refer Appendix 1: Definition of Terms

[20] Maximises time under isotonic tension - concentric tension for the muscles in kicking leg and eccentric tension in the supporting leg - refer Appendix 1: Definition of Terms

As an instructor, I'm now looking to incorporate the specific strengthening as above and maybe adapting some of the Zaichik stretching exercises as well, but I'm proceeding with caution (as I will discuss later) about the latter and sequencing subsequent activities in a club training session - much the same as you would for any static stretching.

I do have a warning for those training in Zaichik's method: having practiced Zaichik's "Splits" stretching program on and off for a month or so I could sense an improvement in my hip ROM as I was feeling that I was getting slightly higher sidekicks with better body position and had also noticed similar improvement in the reverse turning kicks in Eui-Am. I turned up to the last training before Nationals looking forward to showing off my improvements and felt a sharp pain in the adductor on my supporting leg as I did the first Eui-Am High reverse turning kick!

What did I take away as learnings from this?

1. A grade 2 Adductor muscle tear will fortunately, with rest and subsequent massage and gradual strengthening work, recover in about three weeks.
2. Zaichik's stretching protocol gets you more ROM by reprogramming the stretch reflex and you then need to strengthen your muscles in that range to make the range functional before attempting ballistic movement like full speed kicking.
3. If you are using Zaichik's method to get yourself into extended ranges make sure you also do appropriate strength training using that range. I may have just been unlucky to tear the muscle, but my sense is that I had not done enough strength work in my new ROM.
4. That extended length eccentric[21] strength and control in the supporting leg is just as, if not more important than, the hip ROM in your kicking leg.
5. That self-massage (after appropriate rest period of two to three days) significantly seemed to improve my soft tissue recovery.

[21] Apendix 1: Definition of Terms

Myofascial Release – "Pain in the Web"

According to Tom Myers – Anatomy Trains, Fascia is like a spider's web which surrounds and is woven through all our skeletal soft tissue, muscle tendons, and ligaments. Its functions are not completely understood yet but certainly it is involved in neural signaling with our central nervous system which controls our muscle tension and therefore our ROM. Fascia is very responsive to external pressure therefore massage has been shown to have immediate benefits to releasing unnecessary tension in soft tissues.

Tension imbalances in your muscles and fascia are a fact of life as they occur and are present for all sorts of reasons:

- Exercise may cause muscle and soft tissues to become knotted and tight.
- Imbalances in your choice of exercises or work and lifestyle activities may cause strength or tension imbalances in your body. Racket sport players, for example, will be dominant on one side unless they cross-train.
- Not exercising will cause muscles to become weak and tight (excessive sitting).
- Your daily movement patterns, or lack of them, will strengthen some tissues and leave others weak.
- Your mental state effects your nervous system and will create tension in some parts of your body but not other parts.
- Injuries no matter how minor. Post injury rehabilitation is always necessary to some degree to restore functional movement.

The point is that if your fascia and muscles are not free of unnecessary tension, and if the tension they do have is not balanced around the joints, then you will experience pain and instability. Massage assists to rebalance tension and release knots or "trigger points" within the fascia and muscle tissues. Over time, if not corrected, imbalances in tension lead to autonomous movement compensations which lead to instability and damage to joint structure(s). Regular massage will improve/maintain your ROM in the short term and reduce your muscle and joint pain - and you (your body) will thank yourself in the long term.

The running I was doing during my preparation to test for 3rd Dan was causing me to experience increasing pain in my ankles. I was going to the physio on a regular basis and had X-Rays of both ankles which showed I don't have great ankles as far as bone spurs and calcification etc. which elicited a comment from the sports doctor along the lines of "you may need to consider some intervention treatment to sort them out after the grading." This got to the point where by grading day I was gulping down more than the recommended dose of Ibuprofen just to get me through my grading, and my movement was somewhat more suboptimal and less relaxed than usual.

Once the physical work load reduced, the ankle pain reduced, but this would flare up now and again in direct proportion to the amount of training I was doing, especially if it involved

any jumping. Added to this I was also starting to get pain just below both knees. In short, I was hobbling around like an old man.

I researched more about Trigger Points and found that I could significantly relieve my ankle pain by massaging the trigger points associated with my Peroneal muscles (outside shin). I continued with this massage for a month or so and now my ankles are, for the most part, pain free and the knee pain has also gone.

I now pay much more attention to pain in different areas of my body on an ongoing basis and massage regularly checking for “Trigger Points” to release. Believe me, it is an ongoing activity a bit like having to tune a musical instrument - if you want to make music you need to keep your instrument tuned otherwise you get noise. In the case of your body, substitute “noise” for “pain”.

Summary and Conclusion

In summary, I would say to anyone who is not satisfied with their own flexibility or ability to move as well as they would like, they should do something about it sooner, rather than later. Hip ROM is a big factor in the quality of the rest of your life whether you practice Taekwon-Do or not and improving it is as simple as getting of your seat and moving more. As it happens, Taekwon-Do is a great motivator for doing just that and for not being satisfied with normal or average hip ROM.

I would also encourage anyone like me, who has perhaps accepted or resigned themselves to thinking they just aren't flexible, to take a fresh look at their own possibilities as far as improving their ROM and read up on the new thinking around how our bodies operate.

The training considerations I focus on when training to improve ROM in general and specifically at the hips for kicks are as follows:

- "Extended Range" Strengthening is an essential component of your training if you want to enable and maintain active use of increased ROM. Remember it's not about getting bigger muscles, it's about being able to activate and contract what you've got more powerfully over their full length so you are essentially training your nervous system to recruit motor neurons.
- The more contractile strength you have at full extension of a muscle the more strength you will have to fully contract (shorten) that muscle. This is very different from a shortened weak muscle that will be inhibited from fully shortening.
- My thinking is that ROM is a bit like learning to ride a bike - it takes work to programme the skill but once you have it you can maintain it with a lot less effort.

  For some of us, the training and or coaching we are already doing in the Do Jang may well be enough to get ourselves and our students programmed for the extended ROM necessary. But in general terms, two classes a week covering the breadth of syllabus we have will not achieve it for most. Once you have what you need however, two sessions a week may well be enough to maintain extended ROM for most.

  I would also say from an Instructor perspective that because we have such diversity of ages and body types in our classes, the format and types of exercises, no matter how well chosen for balance and sequences, are not going to cater for everyone's individual needs.

  The bottom line is that if you or your students only train Taekwon-Do twice a week for 1.5 hrs then, in order to improve hip ROM, you will all need to commit some additional time targeting your individual ROM weaknesses. This will be the fastest route to improving individual hip ROM and ROM in general for yourself and your students.

- The Zaichik methodology requires some knowledge of muscle anatomy and how it operates to be used most effectively. I like it because it makes sense from my Personal Training perspective. However, I can see how it may seem overly complex compared to say the PNF[22] or isometric contractions during the generalized stretch positions we have become used to.
- In many cases I think it is possible to improve any static relaxed stretching position you are currently using by adding some movement. In the Straddle stretch position, if you lean your torso side to side then flex forward you may find you can improve your hip abduction faster than just a static relax in the straddle. Try it!
- Based on my experience with Pavel's methods, just moving around in almost any static stretch helps you go deeper and adding a relaxing out breath helps as well. Try that too!

  If you further include an isometric contraction of the muscles you are stretching just prior to a relaxing breath, then even better – like PNF (but without a partner) and also similar to both Kurz and Pavel. Try that as well!

- You must find what works for you as far as beating the Stretch Reflex to allow yourself the opportunity to get into extended range positions. Once your nervous system lets you get there, you need to strengthen that range in the muscles by contracting isometrically, eccentrically and concentrically[23] to build the neural pathways that will then reinforce your new ROM and make it useable.
- Use Myofascial Release to "tune your instrument" regularly. Get yourself a foam roller lacrosse ball and massage stick and use them to free the sliding surfaces and fiber structures of muscle and fascia.

I'll continue to use Zaichik techniques for my own conditioning and will look to integrate his techniques and principles into our club training or individually for given students where I think appropriate.

As yet I haven't achieved my goal of active side and front splits. However, I have made more progress in the last six months than in the preceding three years as a result of increased training frequency and experimenting with the Zaichik stretching methods. I have a way to go with my extended range strengthening before I would say that I've made lasting gains to my functional ROM in my hips.

My journey continues.

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[22] Proprioceptive Neural Facilitation – Partner assisted combination(s) of isometric contraction and passive relaxation stretching technique.

[23] See Appendix 1 Definition of Terms

Further Reading

I'm always interested in, and looking for new research or ideas on strength and movement, that will expand my knowledge and enhance my training so feel free to get in touch if you have any comments or suggested further reading. Here's some I recommend for those interested.

Travel & Simons – Myofascial Dysfunction & Pain

An early Western pioneer of soft tissue research was Dr Janet G. Travell in the US, who was the personal physician to President J. F. Kennedy and who's research and practice with Muscle and Fascia (the soft tissue surrounding muscles) lead to the publication of her and fellow researcher (David Simons MD) work "Myofascial Pain and Dysfunction – The Trigger Point Manual" Vol. 1 &2 -by Travel & Simons MD. which is still a key if not the soft tissue reference for manual therapists today.

Tom Myers – Anatomy Trains

Further and more recent work that has hugely influenced how we should all be thinking about how Muscle and Fascia integrate human movement, is by Tom Myers "Anatomy Trains" (now in its second edition). This publication and the discussions it invoked regarding his "Tensegrity" model for the human body had huge impact across the Fitness and Physical Therapy industry in the early 2000's and has literally changed the game since. To the point now where most gyms, fitness professionals and anyone serious about keeping themselves moving well and pain free, now have at least a foam roller and lacrosse ball in their arsenal of training equipment and 'Myofascial Release' has become a commonly used technique across the industry.

Gray Cook - Functional Movement Screen FMS

Gray Cook has developed a series of full body functional "Test" movements to assess the degree to which an individual has good active range of motion. A "Fail" of any test indicates a weakness and or instability which should be corrected.

As already mentioned any habitual or pattern of movement will cause the body, primarily the nervous system, muscles and fascia to adapt. In the initial phase to enable you to accomplish the movement. Our bodies are doing this autonomously and the system has a wide tolerance in regard to poor quality of movement. So what you practice is what you get consciously or autonomously. Most people have heard the term "Muscle Memory", well it turns out there is more truth in that than perhaps the person who first coined it realized.

Over time if we persist with a pattern of movement, that is not functionally compatible with our skeletal joint structures the initial soft tissue adaptions and resultant movement compensations cause structural instability and or damage to joints.

On the other hand, if we don't move enough this is equally bad (sitting for example)

Muscle strength relies upon nervous system activation and the easiest way to achieve that is moving. You could lie in bed isometrically contracting (don't laugh if that were all you could do it may keep you functionally strong enough to still walk when you eventually got up!)

Use it or lose it – and as Gray Cook's saying goes "move well, move often."

Appendix 1: Definition of Terms

The Stretch Reflex - (International Fitness Association)

When the muscle is stretched, so is the muscle spindle (see section Proprioceptors). The muscle spindle records the change in length (and how fast) and sends signals to the spine which convey this information. This triggers the *stretch reflex* (also called the *myotatic reflex*) which attempts to resist the change in muscle length by causing the stretched muscle to contract. The more sudden the change in muscle length, the stronger the muscle contractions will be (plyometric, or "jump", training is based on this fact). This basic function of the muscle spindle helps to maintain muscle tone and to protect the body from injury.

One of the reasons for holding a stretch for a prolonged period, is that as you hold the muscle in a stretched position, the muscle spindle habituates (becomes accustomed to the new length) and reduces its signalling. Gradually, you can train your stretch receptors to allow greater lengthening of the muscles.

Some sources suggest that with extensive training, the stretch reflex of certain muscles can be controlled so that there is little or no reflex contraction in response to a sudden stretch. While this type of control provides the opportunity for the greatest gains in flexibility, it also provides the greatest risk of injury if used improperly. Only consummate professional athletes and dancers at the top of their sport (or art) are believed to actually, possess this level of muscular control.

Components of the Stretch Reflex - (International Fitness Association)

The stretch reflex has both a dynamic component and a static component. The static component of the stretch reflex persists as long, as the muscle is being stretched. The dynamic component of the stretch reflex (which can be very powerful) lasts for only a moment and is in response to the initial sudden increase in muscle length. The reason that the stretch reflex has two components is because there are actually, two kinds of intra-fusal muscle fibres: nuclear chain fibres, which are responsible for the static component; and nuclear bag fibres, which are responsible for the dynamic component.

Nuclear chain fibres are long and thin, and lengthen steadily when stretched. When these fibres are stretched, the stretch reflex nerves increase their firing rates (signalling) as their length steadily increases. This is the static component of the stretch reflex.

Nuclear bag fibres bulge out at the middle, where they are the most elastic. The stretch-sensing nerve ending for these fibres is wrapped around this middle area, which lengthens

rapidly when the fibre is stretched. The outer-middle areas, in contrast, act like they are filled with viscous fluid; they resist fast stretching, then gradually extend under prolonged tension. So, when a fast stretch is demanded of these fibres, the middle takes most of the stretch at first; then, as the outer-middle parts extend, the middle can shorten somewhat. So the nerve that senses stretching in these fibres fires rapidly with the onset of a fast stretch, then slows as the middle section of the fibre is allowed to shorten again. This is the dynamic component of the stretch reflex: a strong signal to contract at the onset of a rapid increase in muscle length, followed by slightly "higher than normal" signalling which gradually decreases as the rate of change of the muscle length decreases.

Lengthening Reaction - (International Fitness Association)

When muscles contract (possibly due to the stretch reflex), they produce tension at the point where the muscle is connected to the tendon, where the golgi tendon organ is located. The golgi tendon organ records the change in tension, and the rate of change of the tension, and sends signals to the spine to convey this information (see section Proprioceptors). When this tension exceeds a certain threshold, it triggers the lengthening reaction which inhibits the muscles from contracting and causes them to relax. Other names for this reflex are the inverse myotatic reflex, autogenic inhibition, and the clasped-knife reflex. This basic function of the golgi tendon organ helps to protect the muscles, tendons, and ligaments from injury. The lengthening reaction is possible only because the signalling of golgi tendon organ to the spinal cord is powerful enough to overcome the signalling of the muscle spindles telling the muscle to contract.

Another reason for holding a stretch for a prolonged period is to allow this lengthening reaction to occur, thus helping the stretched muscles to relax. It is easier to stretch, or lengthen, a muscle when it is not trying to contract.

Reciprocal Inhibition - (International Fitness Association)

When an agonist contracts, in order to cause the desired motion, it usually forces the antagonists to relax. This phenomenon is called reciprocal inhibition because the antagonists are inhibited from contracting. This is sometimes called reciprocal innervation but that term is really a misnomer since it is the agonists which inhibit (relax) the antagonists. The antagonists do not actually innervate (cause the contraction of) the agonists.

Such inhibition of the antagonistic muscles is not necessarily required. In fact, co-contraction can occur. When you perform a sit-up, one would normally assume that the stomach muscles inhibit the contraction of the muscles in the lumbar, or lower, region of the back. In this particular instance however, the back muscles (spinal erectors) also contract. This is one reason why sit-ups are good for strengthening the back as well as the stomach.

When stretching, it is easier to stretch a muscle that is relaxed than to stretch a muscle that is contracting. By taking advantage of the situations when reciprocal inhibition does occur, you can get a more effective stretch by inducing the antagonists to relax during the stretch due to the contraction of the agonists. You also want to relax any muscles used as synergists by the muscle you are trying to stretch. For example, when you stretch your calf, you want to contract the shin muscles (the antagonists of the calf) by flexing your foot. However, the hamstrings use the calf as a synergist so you want to also relax the hamstrings by contracting the quadricep (i.e., keeping your leg straight).

Types of Muscle Contraction

Isotonic Contraction - (Boundless Anatomy and Physiology)

Isotonic contractions generate force by changing the length of the muscle and can be concentric contractions or eccentric contractions.

Concentric Contraction - (Boundless Anatomy and Physiology)

A concentric contraction causes muscles to shorten, thereby generating force.

Eccentric Contraction - (Boundless Anatomy and Physiology)

Eccentric contractions cause muscles to elongate in response to a greater opposing force.

Isometric Contraction - (Boundless Anatomy and Physiology)

Isometric contractions generate force without changing the length of the muscle.

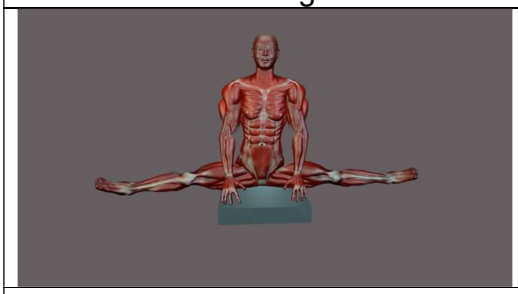
Appendix 2 : Thomas Kurz - Normal Active ROM

Active ROM – The "normal" values quoted in the table below by Kurz are based on the test groups ability to actively move their leg(s) into the "test positions" as opposed to being moved by someone or some external force. The latter would be a measure of "passive ROM" and in general is greater due to neural, muscle and soft tissue restrictions being less due to the individual being relaxed and not "activating" his/her muscles.

Normal Active Range of Motion			
Joint	**Action**	**ROM**	**Description**
Hip	Flexion	110-130 deg	Flex knee and bring thigh close to abdomen
	Extension	30 deg	Move thigh backward without moving pelvis
	Abduction	45-50 deg	Swing thigh away from midline
	Adduction	20-30 deg	Bring thigh toward and across midline
	Internal Rotation	40 deg	Flex knee and swing lower leg away from midline
	External Rotation	45 deg	Flex knee and swing lower leg toward midline
Neck	Flexion	70-90 deg	Touch sternum to chin
	Extension	55 deg	Try to point chin up
	Lateral Bending	35 deg	Bring ear close to shoulder
	Rotation	35 deg	Turn head to left and right
Lumbar Spine	Flexion	75 deg	Bend forward at waist
	Extension	30 deg	Bend backward
	Lateral Bending	35 deg	Bend to the side
Shoulder	Abduction	180 deg	Bring arm up sideways
	Adduction	45 deg	Bring arm toward midline of body
	Horizontal Extension	45 deg	Swing arm horizontally backward
	Horizontal Flexion	130 deg	Swing arm horizontally forward
	Vertical Extension	60 deg	Raise arm straight backward
	Vertical Flexion	180 deg	Raise arm straight forward
Elbow	Flexion	150 deg	Bring lower arm to biceps
	Extension	180 deg	Straighten out lower arm
	Supination	90 deg	Turn lower arm so palm of hand faces up
	Pronation	90 deg	Turn lower arm so palm faces downward
Wrist	Flexion	80-90 deg	Bend wrist so palm nears lower arm
	Extension	70 deg	Bend wrist in opposite direction
	Radial deviation	20 deg	Bend wrist so thumb nears radius
	Ulnar Deviation	30-50 deg	Bend wrist so pinky finger nears ulna
Knee	Flexion	130 deg	Touch calf to hamstring
	Extension	15 deg	Straightout knee as much as possible
	Internal Rotation	10 deg	Twist lower leg toward midline
Ankle	Flexion	45 deg	Bend ankle so toes point up
	Extension	20 deg	Bend ankle so toespoint down
	Pronation	30 deg	Turn ankle so sole faces in
	Supination	20 deg	Turn foot so the sole faces out

Appendix 3: Side Splits Anatomy

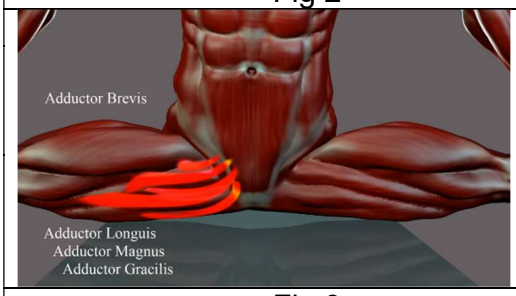
Fig 1



Notes:

- The stronger the contraction you are able to generate at full extension the greater the contraction potential to fully shorten.

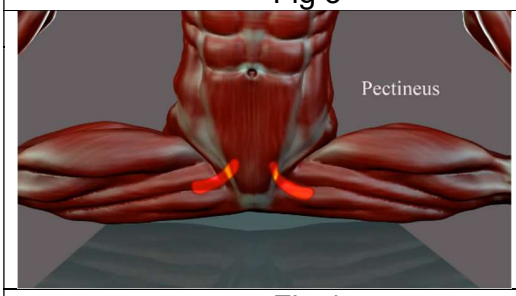
Fig 2



Releasing

Muscle	ACTIONS
Brevis Longus Magnus	Hip Adduction Hip Flexion/Extension Posterior Pelvic Tilt
Gracilis	Hip Internal Rotation Hip Adduction

Fig 3

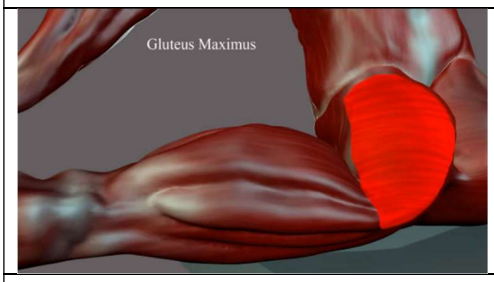


Releasing

Muscle	ACTIONS
Pectineus	Hip Internal Rotation Hip Adduction

Fig 4

Releasing

	Contracting
	
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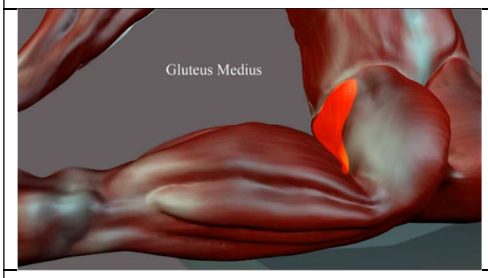	
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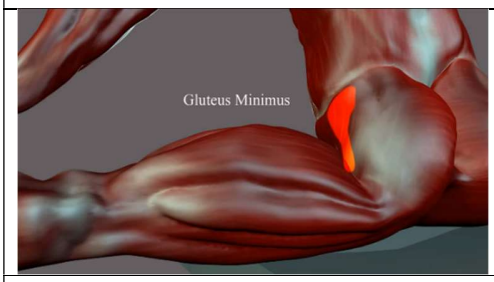	
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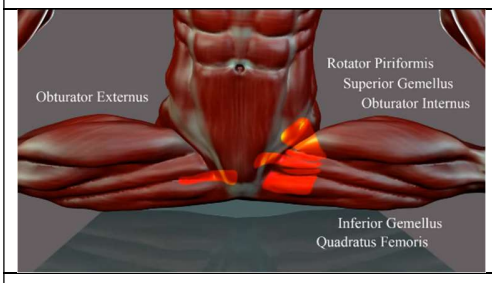	
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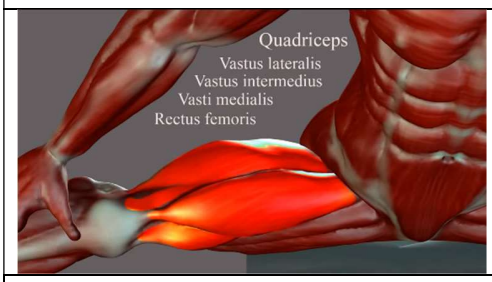
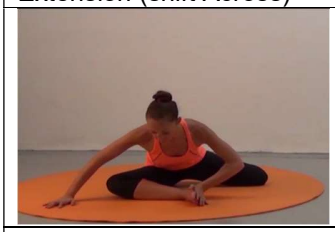
	

Appendix 4: Targeting Adductors

Leverage: Horizontal Extension (shift Across)	Target: Hip Flexion	Muscles
		• Adductor Magnus • Adductor Longus
Leverage: External Hip Rotation	Target: Hip Flexion	
		• Pectineous • Adductor Brevis
		• Gracillis • Adductor Magnus • Adductor Longus
Leverage: Lateral Flexion	Target: Forward Flexion	
		General Adductors

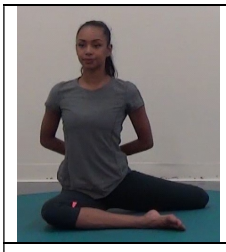
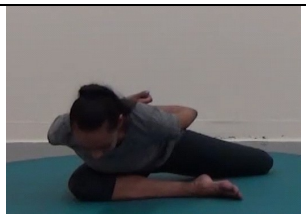
Appendix 5: Extended Length Conditioning - Example Sequence

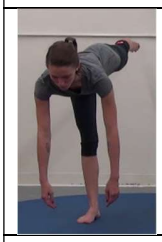
Note: The following sequence of images shows a set of generalized exercises for extended range conditioning.

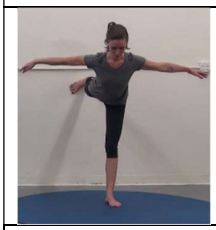
Some are taken from yoga and you will notice a couple are Martial Arts based stances.

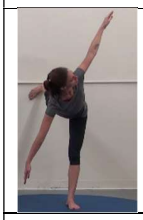
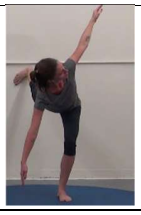
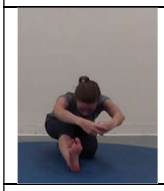
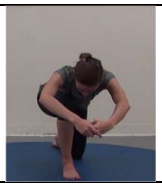
Some are simply held as a balancing exercise, and some are then progressed to incorporate movement of the supporting and or extended limbs.

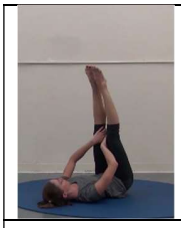
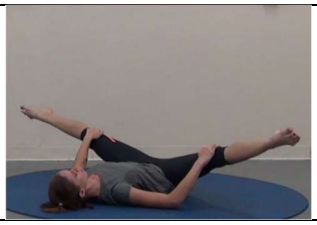
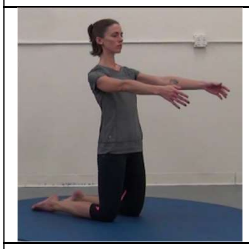
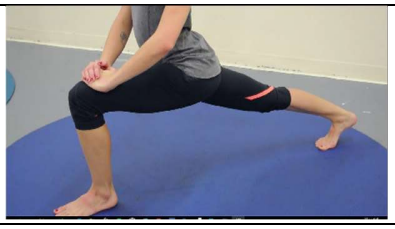
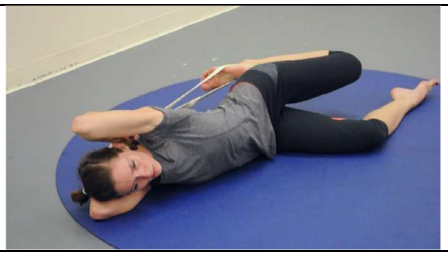
Remember strength is about neural programming.

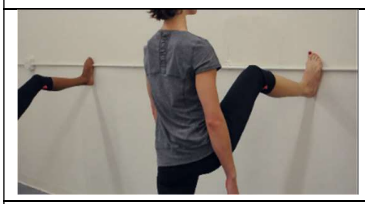
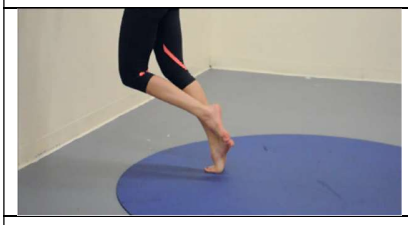
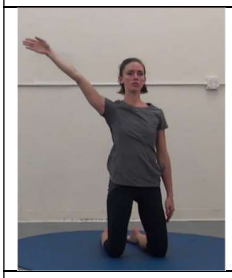
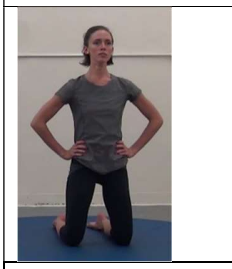
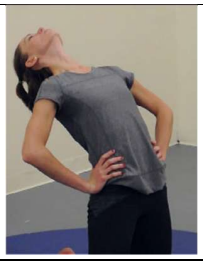



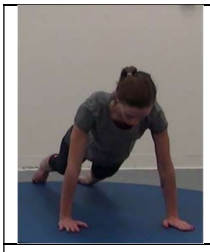



		Hold
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Appendix 6: Myofascial Release & Trigger Points

The therapeutic benefits of massage, although an ancient health practice in many Eastern European and Asian cultures, have only become more apparent and accepted to the Western world in recent years.

Thanks to the early pioneering research and work of Janet Travel (1960's) and more recently Tom Myers (2000's) we can now say that the extent to which imbalances in soft tissue (Fascia & Muscle) tension causes movement compensations and pain leading to chronic dysfunction in the body is hard to over emphasize. And yet is still not fully understood.

Similarly, because of the same work, it is hard to overemphasize the importance of massage or myofascial release techniques in assisting the muscles and fascia regain their balance and optimal tensions to enable the body to, amongst other things, operate to the full ROM of its skeletal design.

I've provided some links on the use of foam rollers, balls and sticks and further reading in the bibliography.

Refer Gray Cook Functional Movement Screen FMS if you want to test how functionally in balanced you are (or not).

If you are experiencing muscle pain and even some joint pain it is highly likely that your soft tissues are over tight somewhere….

The best way to release this unwanted tension is by massage – it's that simple. Fascia is very responsive to manual stimulation and pressure, and where you can reach your body you can easily massage yourself. When it comes to reaching parts of your anatomy you can't reach or you need to apply more pressure then it helps to have some simple tools. You can massage most of yourself in the places that count with the following simple accessories:

- Foam roller or piece of pvc piping (I find 150mm dia. Is good)
- Lacrosse Ball or similar hard ball about 60mm dia
- Massage Stick - Dowel 25-30mm dia. with rounded ends and 400-500mm long
- Massage oil and creams help get in deep when you need to using the stick and your fingers.

The general approach is to apply pressure broadly and gently at first to survey the area and find where the "hot spots "(tender or painful areas) are. Some areas you will know before you even touch them as you will be feeling the tightness. Often however there will be areas that until you put pressure on them you would not have known they were a problem. When you find a hot spot you initially hold a steady pressure on the point until you feel the pain subside. Massage the general area more firmly then repeat the pressure on the "hot" spot again as firmly as you can handle and relax breathe until the pain subsides. Continue in this way until you can apply firm pressure everywhere without pain.

The where and how to massage is fairly straight forward and you'll easily learn what works for you with some practice. There are plenty of how-to's on the internet. If you are really interested in learning how to deal with Trigger Points then Travell & Simons – Myofascial Pain and Dysfunction are the reference books to read.

Appendix 7: Types of Stretches

This is an excerpt from Full-Body Flexibility, Second Edition by Jay Blahnik.

Static Stretching

Static stretching means a stretch is held in a challenging but comfortable position for a period of time, usually somewhere between 10 to 30 seconds. Static stretching is the most common form of stretching found in general fitness and is considered safe and effective for improving overall flexibility. However, many experts consider static stretching much less beneficial than dynamic stretching for improving range of motion for functional movement, including sports and activities for daily living.

Dynamic Stretching

Dynamic stretching means a stretch is performed by moving through a challenging but comfortable range of motion repeatedly, usually 10 to 12 times. Although dynamic stretching requires more thoughtful coordination than static stretching (because of the movement involved), it is gaining favor among athletes, coaches, trainers, and physical therapists because of its apparent benefits in improving functional range of motion and mobility in sports and activities for daily living.

Note that dynamic stretching should not be confused with old-fashioned ballistic stretching (remember the bouncing toe touches from PE classes?). Dynamic stretching is controlled, smooth, and deliberate, whereas ballistic stretching is uncontrolled, erratic, and jerky. Although there are unique benefits to ballistic stretches, they should be done only under the supervision of a professional because, for most people, the risks of ballistic stretching far outweigh the benefits.

Passive Stretching

Passive stretching means you're using some sort of outside assistance to help you achieve a stretch. This assistance could be your body weight, a strap, leverage, gravity, another person, or a stretching device. With passive stretching, you relax the muscle you're trying to stretch and rely on the external force to hold you in place. You don't usually have to work very hard to do a passive stretch, but there is always the risk that the external force will be stronger than you are flexible, which could cause injury.

Active Stretching

Active stretching means you're stretching a muscle by actively contracting the muscle in opposition to the one you're stretching. You do not use your body weight, a strap, leverage, gravity, another person, or a stretching device. With active stretching, you relax the muscle you're trying to stretch and rely on the opposing muscle to initiate the stretch. Active stretching can be challenging because of the muscular force required to generate the stretch but is generally considered lower risk because you are controlling the stretch force with your own strength rather than an external force.

Every stretch is static or dynamic and passive or active, as illustrated in the examples shown in table 1.1.

TABLE 1.1 Stretching Technique Classifications

	Static	Dynamic
Passive	Static-passive calf stretch 	Dynamic-passive calf stretch 
Active	Static-active calf stretch 	Dynamic-active stretch 

You might hear or read about other techniques and terms used in stretching (especially by coaches and athletes), such as proprioceptive neuromuscular facilitation (PNF) stretching or active isolated stretching. These techniques are all simply variations of these four types of stretches.

Most of the stretches you see and do are likely static-passive stretches. Static-passive stretches are the most common stretches and the easiest to perform. If executed with good technique, these stretches are effective in improving flexibility and range of motion.

However, most experts now agree that although static-passive stretches have many benefits, it's best to do more dynamic-active stretches. Because dynamic-active stretches require you to use and build your own strength while moving through the stretch, they are more helpful for improving functional movements used in everyday life and in sports. In addition, because dynamic-active stretches are movement oriented, these stretches can help generate heat, which can make the muscles more pliable. Finally, evidence suggests that because dynamic-active stretches require muscle activation and contraction, the muscles being stretched are triggered to relax even more than they might during a static-passive stretch, thereby reducing the risk of injury while increasing the functional benefit.

This does not mean you should avoid or minimize static-passive stretching. Just be aware that there appear to be quite a few advantages and benefits to dynamic-active stretching and that you should include these types of stretches as often as is comfortably and conveniently possible for you.

Appendix 8: Links & Bibliography

Range of Motion Tests

Hip Abduction/Aduction Test:

https://www.youtube.com/watch?v=7aZaNgBv49g

Hip Internal/External Rotation Test:

https://www.youtube.com/watch?v=qlfbE0sa9XU

Thomas Kurz – Stretching Scientifically: a guide to flexibility training 4th Edition

Printed in the US 1987, 1990,1991, 1994, 2003

https://www.amazon.com/Stretching-Scientifically-Guide-Flexibility-Training/dp/0940149451

Excerpts published in Fighting Arts magazine

http://www.fightingarts.com/reading/article.php?id=12

http://www.fightingarts.com/reading/article.php?id=16

http://www.fightingarts.com/reading/article.php?id=17

Pavel Tsatsouline

Relax Into Stretch 2001

https://www.amazon.com/Relax-into-Stretch-Flexibility-Mastering/dp/0938045288

Super Joints

http://www.bookdepository.com/Super-Joints-Pavel-Tsatsouline/9780938045366?ref=pd_detail_1_sims_b_p2p_1

Paul Ziachik

Easyflexibility – website

https://www.easyflexibility.com/

Elasticsteel - website

http://www.elasticsteel.net/

Gray Cook – Functional Movement Screen

http://www.functionalmovement.com/

Janet G. Travel MD & David G. Simons MD – Myofascial Pain and Dysfunction

https://www.bookdepository.com/Travell-Simons-Myofascial-Pain-Dysfunction-v-1-v-2-Janet-G-Travell/9780683307719

Tom Myers – Anatomy Trains

https://www.anatomytrains.com/about-us/certified-teachers/tom-myers/

Myofascial Release – How To Example (Breaking muscle.com)

There are any number of “How To’s on Myofascial Release on the internet now. I’ve chosen this one because it has an interesting description of fascia included.

https://breakingmuscle.com/mobility-recovery/foam-rollers-dont-work-understanding-myofascial-release