

Effective Stretching for Taekwon-do Nicola Tse – 4th Dan Essay 2016

Many of us will be generally aware we need to stretch to improve our performance, but knowing which type to use and when is imperative to ensure we stretch safely and minimise the risk of injury. I'll outline the most common type of stretches we would use in class and we as instructors and practitioners need to be aware of.

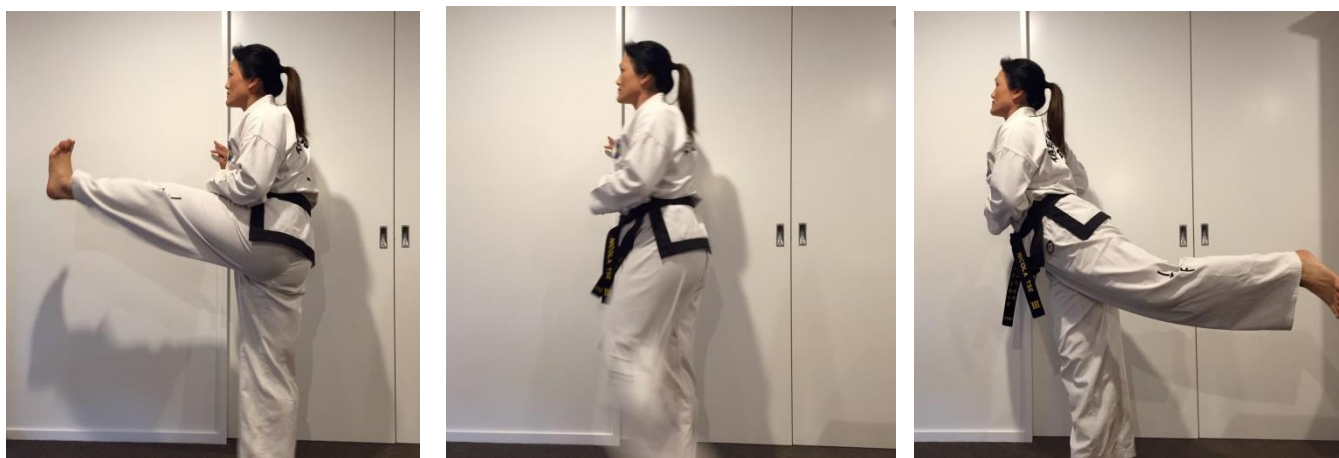
The following areas will be covered:

1. common types of stretches
2. Factors which influence your ability to stretch
3. the advantages and disadvantages of each method
4. the “un-stretchables”

1. Common types of stretches

You will all be familiar with the forms of stretching your instructor typically takes you through either at the start, or end of class. It's important to know the different types and when it's best to use them as stretching when the body has not been properly prepared is likely to lead to injuries in the short term and long term.

- a. Dynamic stretching** - this type of stretch typically conducted at the beginning of class is becoming more favoured among athletes, coaches and trainers due to its benefits in improving range of motion and mobility in sport and daily life. It *“...requires the use of continuous movement patterns that mimic the exercise or sport to be performed. Generally speaking, the purpose of dynamic stretching is to improve flexibility for a given sport or activity.”* [1]. The advantage of Dynamic stretching is it has a dual purpose – it not only stretches the muscle, but the movement warms the body and helps prepare muscles for more extensive stretching.



Dynamic Stretch - Example 1: *Left leg continuously swings forward and back has a dual purpose of warming up the body as well as stretches the muscle.*

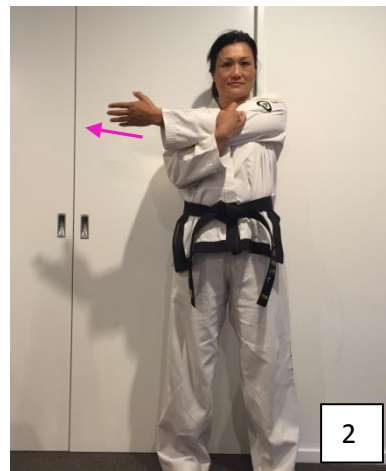
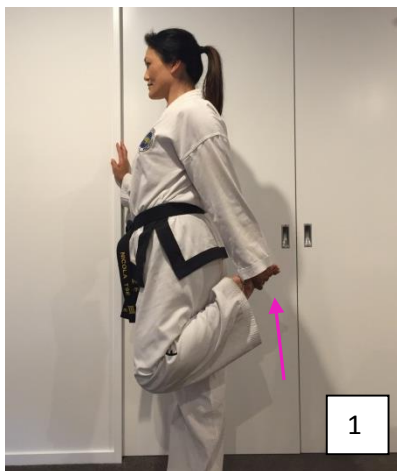


Dynamic Stretch - Example 2: *Both arms swing around the body in a forward and backward motion*

- b. Static Stretching** – this is the most common type of stretching – you will often see runners with their hands up against a wall, building, lamp post, or fence and seemingly doing their best to push it down. What they are actually doing is static stretching. This is defined as a stretch “...executed by extending the targeted muscle group to its maximal point and holding it for 30 seconds or more [1]”. This type of stretch is best performed after an intense workout session where the muscles are very warm and you’re entering the “cool down “phase of your session. During this phase your muscles are most prepared. For safety reasons, it is recommended to perform maximum stretching when you are at your warmest.

There are two types of static stretches:

- 1. Active:** this method of stretching involves the individual applying added force for a deeper stretch. With active stretching, the muscle to be stretched is relaxed with the objective of working the opposing muscle to assist with the stretch. The muscular force required to generate the stretch can be difficult but this stretch is generally considered lower risk as the individual, rather than an external force is controlling the stretch [2].



Active Static Stretch – Example 1: *Targets the quadricep muscle. The opposing muscle is the hamstring which contracts to assist the stretch. Example 2:* *This stretches the back of the arm and targets the tricep and upper shoulder.*

2. **Passive:** where added force is applied by an external source (e.g., partner or device) to increase intensity. Care needs to be taken as the external source does not know what your limits are; only you know this. Some tools for assistance include body weight, a strap, yoga block, leverage, gravity, another person, or a stretching device. With the method of passive stretching, you relax the muscle you are stretching and use the external force to hold you in place, enabling a better and deeper stretch. You don't often have to work too hard with passive stretches, but the likelihood of injury is higher than static due to the external factor.



Passive Stretch – Example: *In this technique, the stretch to the hamstring is assisted with a power band*

- c. **Ballistic Stretching** – This is another type of stretch which employs a repetitive bouncing movement to stretch the targeted muscle. While these bouncing movements usually trigger the stretch reflex and may cause increased risk for injury, they can be safely performed if done from low-velocity to high-velocity and executed before static stretching [1].



Ballistic Stretch – Example: *An alternative hamstring stretch using the Ballistic technique showing the “bounce”*

- d. **PNF Stretching** - Proprioceptive Neuromuscular Facilitation, or PNF for short, is an effective way of using reflexes to assist muscular relaxation and has been quoted as “one of the most effective forms of flexibility training for increasing range of motion” [3].

There are 3 PNF stretching techniques:

1. Hold-Relax

This technique is performed with your stretch partner holding your extended legs (in this stretch example) horizontally to a point of mild discomfort. This passive stretch is held for 10 seconds.

Upon command, you isometrically contract your legs by pushing your extended legs in against your partner's feet. The partner should apply just enough force so that the leg remains static. This is the 'hold' phase and lasts for 6 seconds.

You are then instructed to 'relax' and your partner moves to extend your legs further, completing a second passive stretch held for 30 seconds. You know you are doing it right if there is mild discomfort and the extended legs should move further than before (i.e. greater hip flexion).



Partner stretches your legs to a point of mild discomfort for 10 seconds



On command you contract your legs against your partners' feet. Hold for 6 seconds



Relax the contraction. Your partner moves to extend your legs even further for a further 30 seconds

2. Contract-Relax

In this stretch, your partner moves your extended leg to a point of mild discomfort. This passive stretch is held for 10 seconds.

On instruction, you concentrically contract your hamstrings by pushing your extended leg against your partner's feet. The partner should apply enough force so that there is resistance while allowing enough movement to enable you to bring your legs together (i.e. through the full range of motion). This is the 'contract' phase.

You are then instructed to 'relax' and your partner completes a second passive stretch held for 30 seconds. If you are performing this stretch correctly, your extended leg should move further than before (greater hip flexion)



Partner stretches your legs to a point of mild discomfort for 10 seconds



On command you contract your legs together against your partners' feet through full range of motion



Relax the contraction. Your partner moves to extend your legs even further for a further 30 seconds

3. Hold-Relax with Opposing Muscle Contraction

In this final stretch method, your partner holds your extended leg to a point of mild discomfort. This passive stretch is held for 10 seconds.

On instruction, you isometrically contract your hamstrings by pushing your extended legs against your partner's feet. The partner should apply just enough force so that the leg remains static. This is the 'hold' phase and lasts for 6 seconds.

Your partner completes a second passive stretch held for 30 seconds, however this time you are instructed to flex the hip (i.e. pull the leg in the same direction as it is being pushed). This allows the final stretch to be greater.



Partner stretches your legs to a point of mild discomfort for 10 seconds



On command you contract your legs against partners' feet. Hold for 6 seconds



Your partner moves to extend your legs even further for a further 30 seconds whilst you flex hip in same direction of stretch

Guidelines for PNF stretching: [2][3]

- Leave 48 hours between PNF stretching routines.
- Perform only one exercise per muscle group in a session.
- For each muscle group complete 2-5 sets of the chosen exercise.
- Each set should consist of one stretch held for up to 30 seconds after the contracting phase.
- PNF stretching is not recommended for anyone under the age of 18.
- If PNF stretching is to be performed as a separate exercise session, a thorough warm up consisting of 5-10 minutes of light aerobic exercise and some dynamic stretches must precede it.
- Avoid PNF immediately before, or on the morning of competition.

2. Factors which influence your ability to stretch

So you know you should stretch to improve your flexibility i.e. the range of motion of your joints, ligaments, tendons and muscles or the ability of your joints to move freely and generally it should feel good after a good stretch, but there are factors that either assist or prevent your ability to stretch regardless how much to try.

There are both internal and external influences which affect your flexibility. Some key influences are listed (but not limited to) [4]:

- the type of joint or muscle - some joints are not designed to be flexible. Refer to "un-stretchables" further in this essay.

- the elasticity of muscle tissue - muscle tissue that is scarred due to a previous injury is far less elastic than uninjured tissue.
- the elasticity of tendons and ligaments - ligaments have limited elasticity; tendons should not stretch at all.
- the ability of a muscle to relax and contract
- the temperature of the joint and associated tissues

External factors:

- the temperature of the immediate environment - a warmer temperature is more conducive to increased flexibility.
- the time of day - most people are more flexible in the afternoon than in the morning, peaking from about 2:30pm-4pm.
- age - pre-adolescents are generally more flexible than adults
- gender - females are generally more flexible than males.

Some sources also suggest that water is an important dietary element with regard to flexibility. Increased water intake is believed to contribute to increased mobility, as well as increased total body relaxation.

The focus of stretching is in the muscle and where the tendons connect to the muscle – these are the main areas affected by stretching.

Muscles are naturally extremely elastic, and can stretch up to 1 and a half times its own length; however tendons if stretched beyond 4% of their length can be permanently damaged. The stretch needs to therefore come from the belly (centre) of the muscle out to where the muscle reaches the tendon.

Gentle stretches allows the muscle to relax and lengthen naturally and if performed correctly will have a relaxing effect. Intense stretching beyond your limits is likely to cause damage to tissue in the muscle.

3. The advantages and disadvantages of each method

There are some very obvious advantages to stretching, after all we do it in class before and after training – surely it's got to be good for us! Yes stretching does improve your flexibility (range of motion) which may improve your performance and allow you to move more effectively lowering your risk of injury. Stretching also helps to elongate the muscle reducing stiffness and soreness. The downside however, includes tissue damage if the stretch is performed too intensely and increased risk of injury if the wrong type of stretch is performed. If muscles can't relax, your range of motion will not increase also stress placed on bouncing movements can increase risk of injury. PNF stretching reduces maximum strength after the stretch. Some stretches require a partner to get the maximum benefit.

The table below list specific advantages and disadvantages of the 4 types of stretches previously discussed: [6][7]

Advantages	Disadvantages
Static	
<ul style="list-style-type: none"> • Very safe 	<ul style="list-style-type: none"> • Only improves flexibility at a specific body position
<ul style="list-style-type: none"> • Can be done in any environment without any equipment or partners 	<ul style="list-style-type: none"> • Not effective for those wanting to increase flexibility in multiple range of motion
<ul style="list-style-type: none"> • A slow, easy pace conducive to relaxation and effectiveness 	<ul style="list-style-type: none"> • Can take a very long time particularly if your regime is for static stretches for the entire body
<ul style="list-style-type: none"> • considered the safest form of stretch due to the ability to control the limits 	<ul style="list-style-type: none"> • Lack of physical exertion means the body's temperature is somewhat cooler than it could be for an effective stretch.
<ul style="list-style-type: none"> • the best stretch to use for aches, pains and cramps. Other forms of stretching can irritate and worsen an issue 	<ul style="list-style-type: none"> • stretch is limited to the body's natural range of motion
<ul style="list-style-type: none"> • can be done by almost anyone, with little training. It can even be done by people who are very out of shape or weak 	<ul style="list-style-type: none"> • not effective for stretching certain muscle groups
Dynamic	
<ul style="list-style-type: none"> • Extremely useful for people warming up for an activity that requires wide range of motion (i.e. athletes), especially when speed is involved 	<ul style="list-style-type: none"> • Not safe for everyone. Should be used only by those who have been shown the proper movements
<ul style="list-style-type: none"> • Dynamic stretching can be used as a warm up exercise whilst getting your stretch in at the same time. 	<ul style="list-style-type: none"> • Injury is more common during this type of stretching technique
Ballistic	
<ul style="list-style-type: none"> • Improves dynamic flexibility 	<ul style="list-style-type: none"> • You MUST warm up BEFORE Ballistic stretching
<ul style="list-style-type: none"> • Maximizes your muscles range of motion 	<ul style="list-style-type: none"> • the quick bouncing motion increases the risk of injury
<ul style="list-style-type: none"> • Increases motor performance of muscles 	<ul style="list-style-type: none"> • the extended range of motion can cause muscle soreness more than other stretches e.g. Static Stretching
<ul style="list-style-type: none"> • Can be used as a warm up 	<ul style="list-style-type: none"> • often performed incorrectly i.e. stretching too quickly or too hard
PNF	
<ul style="list-style-type: none"> • significantly increases range of motion 	<ul style="list-style-type: none"> • generally requires a partner to help
<ul style="list-style-type: none"> • Interestingly, greater muscle relaxation can occur with PNF 	<ul style="list-style-type: none"> • Arguably the level of risk of injury is increased especially if proper form is not observed
<ul style="list-style-type: none"> • PNF seems to improve stability surrounding joints and has other beneficial effects on strength such as increased strength at the limits of range of motion 	<ul style="list-style-type: none"> • The contraction phase of PNF can cause people to hold their breath and for blood pressure to rise as a result

Generally, it is recommended to perform dynamic or ballistic and stretches before a workout and static or PNF stretches after the workout.

4. “The Un-Stretchables”

According to painscience.com, the problem with stretching are the limitations of biomechanics: many large muscles are physically impossible to apply much tension to. They are anatomically arranged in a way that makes stretching them awkward and attempting to stretch them is simply impossible.

An example of an *un*-stretchable muscle is the thick shin muscle - the meat in the meaty part of the shin is actually a muscle responsible for lifting the foot. It is elongated by pointing the toe like a ballerina. However, the ankle joint only goes so far in that direction — its range of motion is strictly limited by the shape and arrangement of the ankle bones. There’s minimal variation in this limit from person to person [5].

Short of breaking your ankle, there is just no way to flex enough to stretch your shin muscle. At maximum flexion, the muscle is not really “stretched”, but rather mildly elongated. It is certainly longer than it is when it is contracted, but it is not being subjected to strong tensile force. It cannot be satisfyingly stretched!

Other muscles you can stop trying to stretch include:

Un-stretchable muscle	Why
Back of neck – mildly stretchable, otherwise very limited for most	Chin hits the chest, limiting the stretch
Shoulder – the small muscle inside the shoulder that lifts the arm to the side	Lifting the arm is possible to a degree, but in the opposite direction is physically impossible as the torso gets in the way
Forearm – the muscle that rotates the forearm to turn the palm upwards	Rotating it the other way to stretch is not possible as the Ulna (long thin bone in the forearm, furthest to the thumb) collides with the other bone in the forearm (radius)
Bottom (aka Gluteus Maximus) – the muscle that brings the knee towards you.	Limited by the fact that your belly will hit the thigh before maximum flexion has been achieved.
Bottom (aka Gluteus Medius/Minimus) – lifts your leg out to the side	Flexing outwards can be achieved, flexing inwards is somewhat limited with the opposite leg getting in the way. But this can be adapted to stretch around the standing leg
Quads – stretching a quad is actually only stretching about 10–15% of the mass muscle groups in the quad. It feels like a strong stretch, and it is, but only of a single muscle tissue. The other 85–90% (3 muscles) remain only mildly elongated.	Limited when the calf hits the hamstring. Even more surprising is that stretching most of the quadriceps strongly is not only impossible, but clinically unimportant.
The foot arch	A bio mechanical limitation – we physically cannot stretch the foot if we have aching arches
The IT Band - Not technically a muscle, although it feels like one	IT band unbelievably tough, but it cannot even slide or elongate because it is firmly attached to the thigh and femur.
Lower Back	Some degree of backward flexion, but maximum forward flexion is impossible as your ribs do not allow you to fully curl forward.

In Summary

The four basic types of stretching instructors and practitioners must be aware of include, dynamic, static, ballistic and PNF (Proprioceptive Neuromuscular Facilitation) methods.

It is recommended dynamic and ballistic stretching is performed before you work out as these methods employ a "warm up" component and prepares the muscles to take on greater flexibility. Static and PNF methods are recommended after a workout.

PNF is perhaps considered the most effective method of stretching as it employs a full range of motion. Following the suggested guidelines will minimise any risk of injury.

Apart from physiological make up and gender, there are many other internal and external factors impact on your ability to stretch.

All 4 method of stretching has its advantages and disadvantages and you must be aware which one is best to use in the situation as employing the wrong technique may cause injury to you or your students.

Not every muscle in the body can be stretched, interestingly the quad muscle is largely not (and cannot) be fully stretched.

Regular stretching (daily or even three times per week), separate from a strenuous workout may improve flexibility and therefore performance in Taekwon-do.

References

- [1] acefitness.org
- [2] humankinetics.com/excerpts/excerpts/types-of-stretches
- [3] sport-fitness-advisor.com/pnfstretching.htm
- [4] web.mit.edu/tkd/stretch/stretching_3.html
- [5] www.painscience.com
- [6] McMillian, D., et al. "Dynamic vs. Static- Stretching Warm Up: The Effect on Power and Agility Performance". Journal of strength and Conditioning Research 2006.
- [7] "High performance stretching with PNF" (www.stafford-lau-gar.org)

For a list of commonly asked questions relating to stretching and martial arts, refer to <http://www.martialartsplanet.com/forums/showthread.php?t=85373>