

How does human anatomy contribute to one's ability to perform Taekwon-do techniques?

Thesis For Grading to IV Dan

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Introduction:

I naturally have always been an active person, both mentally and physically. I tend to ask why and not go with the flow of what everyone else is doing. I find being inquisitive by asking questions and doing further research benefits my ability to understand and perform the techniques required in the learning of Taekwon-do. I also find this can be applied in my every day at work and at home.

Starting to learn the art of Taekwon-do as a teenager, I found that the learning and performing of techniques came to me a lot easier due to being nimbler and having more bountiful energy. Through my transition into ITF NZ taekwondo 20 years later, I found that an increased amount of thought and consideration was required in order to learn and perform specific techniques. Due to a decrease in natural motility as I have aged, I have found that if I was to forgo the extra thought process and research that comes along with learning a technique, I am more likely to suffer from injury. I also find that although I am researching and asking questions in order to avoid damage, my style and understanding has also increased as a result.

My primary source of exercise outside of the realm of Taekwon-do comes from running. By understanding my running style to keep mobile, I had to find ways to remain supple and hold onto the flexibility needed when returning to taekwondo training multiple times a week. And in contrast, I also found that Taekwon-do affect my ability to perform when running, and I needed to investigate commonalities.

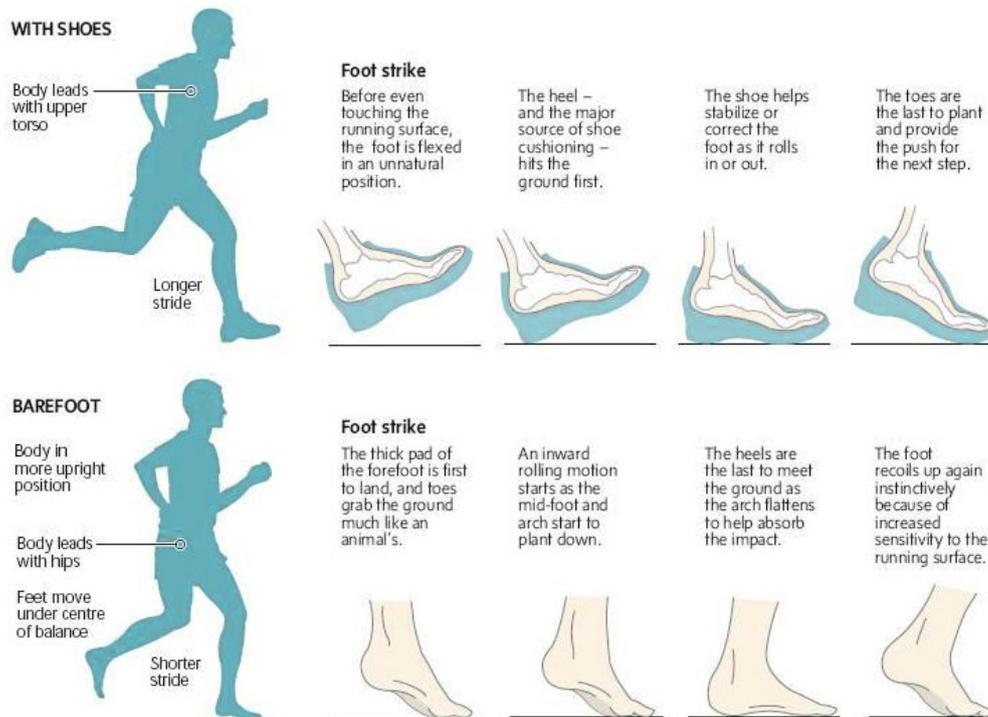
In this thesis, I have chosen to explore in a generalised fashion the reasons why some students might not be able to perform specific techniques to a standard acceptable by ITF Taekwon-do and outlined by Our Technical committee. Thus, provide teaching and conditioning techniques to provide a knowledge base as to why they cannot perform these techniques and how they can improve their form. I am not a trained medical practitioner by any means, and I do not intend anything within this document as a means of diagnosis purely as a means to help and form a greater level of understanding for them.

As time has progressed in history, there has been a definite push towards modernisation in essentially all factors of our lives. It's not until you are potentially injured or struggle with tasks that you feel should come naturally to you that you look into the effects modernisation has had on us as individuals and society. An example of modernisation affecting us is the gradual increase in the supportiveness of our shoes, more specifically running shoes. Researching barefoot running looks into how humans have moved for thousands of years, why we move the way we do, and the associated biomechanics.

We, as modern-day humans, walk around all day with foot protective/ cushioned/ corrective footwear until we walk into dojang, which presents with potential issues relating to functional strength in what we are about to undertake.

The use the supportive modern day running shoes that are available to us now have changed the way we run. Through the use of the extra support in modern day shoes the natural gait in which a person runs in is altered. A running gait is the cycle one's body travels through as they run. The support leads

to a running gait where one has a longer stride leading with the upper torso and striking their foot in an unnatural manner. Striking with the heel first means that majority of the of the force created as you hit the ground is impacted by your heel all at once, as with a barefoot running/less artificial support method you tend to strike with the ball of your foot first then flattening your foot until your heel touches the ground, this results in a slower more distributed absorption of the force created as you hit the ground.



Foot and strengthening applied to students.

When assessing the ability of a new or existing member, we look at how and if they can perform our stances and techniques taught in Taekwon-do. When assessing their ability to perform techniques, very seldom do we determine if they are able to rotate on one foot before performing kicks or kicking pads.

Through the training/teaching of our students at Dragons Spirit Wanganui and observing the differing students' physical abilities and limitations, trying to teach good technique and then conducting some range of motion drills and exercises, to then physically assessing their range of motion whilst students were in a sidekick chamber position. It had become evident to me that some student struggled with rigid structural limitations generally to do with their hips, that prevented middle to high section kicks. This became an issue as they were not able to perform techniques in a way that would conform to our acceptable definition of the side and turnings kicks.

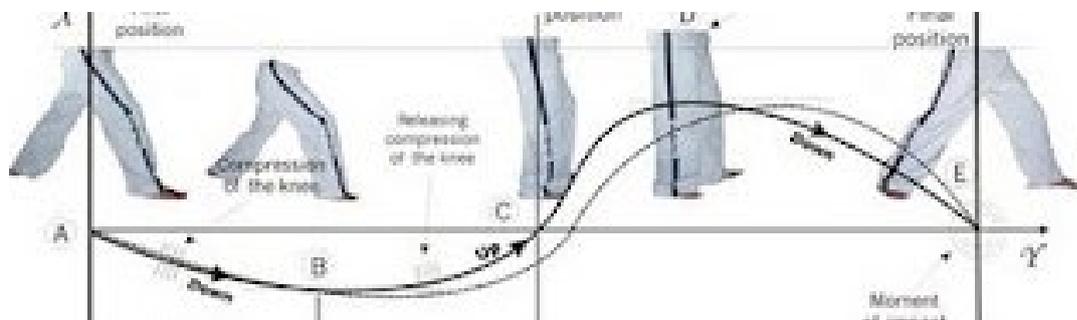
Once the Students can perform the basic stances in a proficient manner, we are then able to teach them various different kicks. These include front section kicks, front snap, rising etc. From my time teaching various students I have noticed that when we move them on to turning and side piercing kicks there are a reasonably high number of students who were not able to transfer their weight onto a

singular foot and rotate the foot in close to a 180° —doing this whilst spinning/ turning their pelvis over to form a pre kicking chamber position and then kicking to the midsection or Kaunde which was at times difficult for some students.

From the feet up!

Whether jumping around performing flying kicks or just walking freely around the dojang, it will become apparent very quickly if we are not utilising our natural shock absorbers through the shock of heel pain as we land or step. If we are to perform, we need to have good muscle tone and mobility in our feet and calves to absorb the body's Kinetic energy and vice versa freely. We need to have sufficient muscular power to jump, spin, kick, etc.

In ITF Taekwon-do, our natural human movement is explained by the utilisation of sine wave. In a mixture of open and closed Kinetic Chain movements.



Movement of the foot hinges around the ankle and is referred to as dorsi (Upward) and Plantar (Downward) flexion as well as an internal and external rotation, these movements are generally performed with varying levels of deflection of the knee.

Far more extensive discussion and research have been carried out in relation to "Barefoot running" and the supposedly new fad with people running with minimalist footwear due to the injury rates from running, it can be argued that walking and running is a natural movement and thus the question of style, either forefoot striking or rear though needs to be put into technique in a similar fashion to Taekwondo.

Common conclusion I have found is that many people today are maladapted to barefoot exercise because of biomechanical abnormalities. This can be due to our modern comfortable lifestyles that diminish flexibility or neuromuscular skill, when people exercise in excess without properly adapting their musculoskeletal system or when they exercise without appropriate protection from their shoes.

During childhood, when bone structures are developing, supportive cushioned footwear with arch support prevents pronation and natural torquing moments from walking around in everyday life. We can assume shoes contribute to weak inflexible feet. This weakness may limit the foot's ability to provide stability and other vital functions.

If foot muscles respond to loading like other muscles in the body, then exercising barefoot or in minimal shoes will strengthen the arch's muscles more than in shoes with arch supports and likely also require more foot muscle strength to avoid injury with the greater ability to absorb and deal with ground reaction force along with the group of muscles forming the calf compromising of the

gastrocnemius and soleus which both connect with the Achilles tendon which allows free movement. Ideally, a two-foot landing is sought to distribute the impact evenly that, depending on the height of the drop, up to ten times the body weight can be applied to the feet and ankles.

We also need to consider whether a dragging pulling action through the calf and hamstrings is as effective as a pushing action through the flexion of the foot and through the calf, quadriceps, and then glutes which clearly the second is far more potent with larger muscle groups engaged, this relies on a punching action from the slight rear of our centre of gravity to full extension.

This became evident that a large proportion of the students needed work due to their lack of ability to pivot with a large percentage of total weight applied to a single foot. I then researched what exercises I could introduce into our training schedule/ warm-up on a regular basis

During the initial analysis, I was looking for their ability to rotate into a "Chamber position" and complete some minor new exercises and a range of motion assessment of the ankle, which additionally affects the ability to perform our linear stances as set out in Volume 2 of the Encyclopaedia of Taekwondo.

Additionally, as General Choi set out in the Training secrets of Taekwon-do,

"We must understand the purpose and method of each movement clearly."

To do so, I broke down the movements and analysed and identified them separately from the beginning of the action.

Elements to consider are

- What is stance?
- One's positioning within the sine wave,
- Having Bent or straight legs
- What forces are applied to the ground upon movement?
- The frictional resistance due to contact area of feet
- Is there a pronated or supinated lean of the foot?
- The lateral rotation angle of the feet
- What is the most applicable for the action?
- What mobility is required throughout the range of movement?
- The amount of balance required

Working through these elements and appropriate time available, We Identified the initial items to work on.

- The range of movement in the linear plane
- The ability to perform exercised without fatigue
- The strength required to hold a particular stance or position.
- What has the most net benefit gain from targeted exercises?

Additional items needing to be considered were

- If Members carrying an injury
- The expectations of differing members
- If members have any range of motion issues.
- Skeletal structural differences

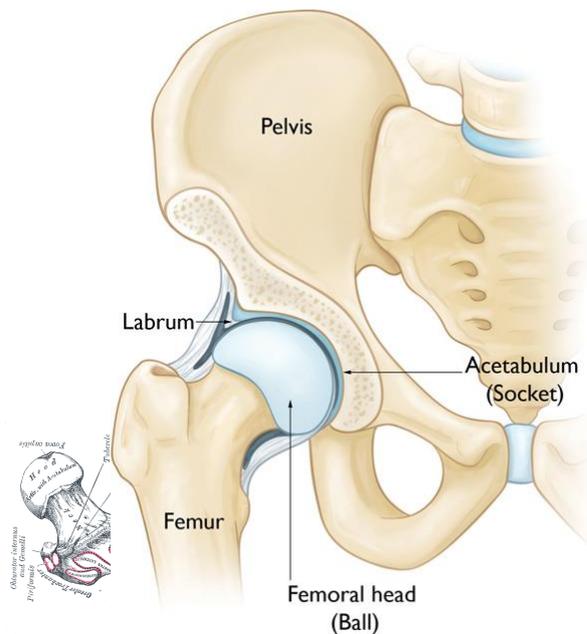
In doing so we found that some of the apparent range of motion limitations were not due to a lack of flexibility and there were some range of motion limitations.

To establish the extent of a particular members range of motion challenges, we prescribed a list of static stretches they could carry out including

- Butterfly stretch (Hip Flexors)
- Frog Stretch (Hip abductors)
- Pigeon Stretch (It Band)
- Hamstring stretches (singular and double leg)
- Sphinx stretches

After several months of persistence and reassurance that they were stretching regularly the students had asked them to perform a side kick and stop mid-way through in the chamber position. Whilst providing addition balance support, I held their knee and hip to assess their range of motion, it was very apparent that there were some structural limitations and the additional torque being applied would not assist and was more likely to injure. Additionally, whilst training with fellow Dan's I conducted a similar trial with my peers and found another member with similar limitations.

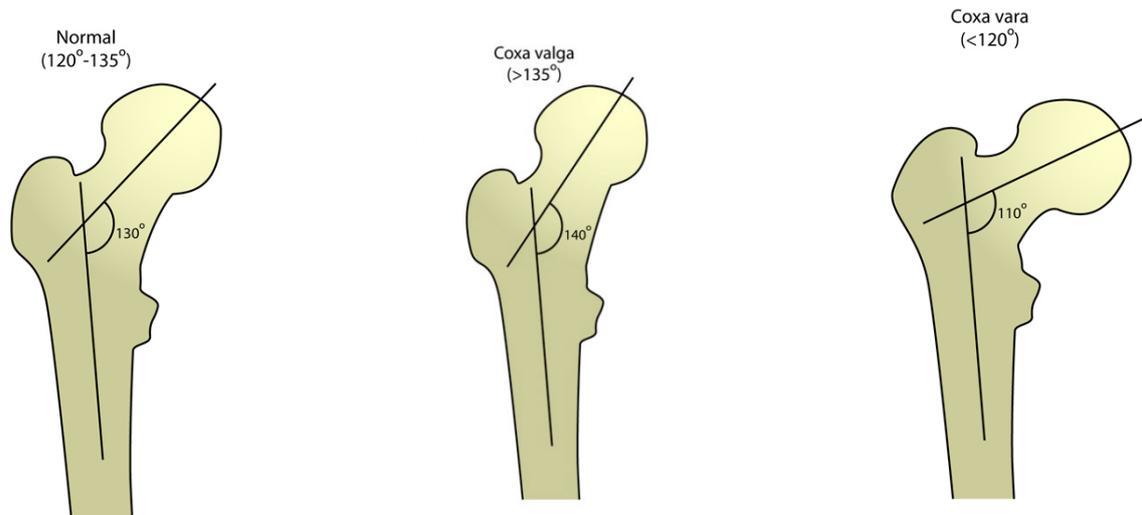
Research was required to improve my level of understanding and knowledge other than casting judgement,



In a healthy hip, the femoral head fits perfectly into the acetabulum.

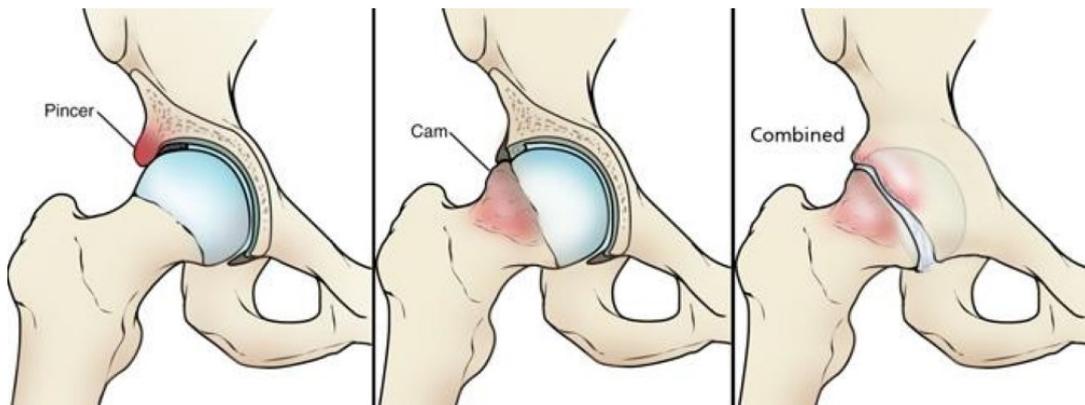
From further research, I have found as there are varying potential causes varying from congenital anatomy to physiological structure influenced by an external environment, i.e., modern-day society. Or potential degradation of the femur head and or hip socket due to injury or overuse.

Typically, there are three classified configurations of Femoral neck angle, which are a range of head angles defined as normal 120° - 135° , Coxa valga $>135^{\circ}$ and Coxa Vara at $<120^{\circ}$



Coxa Valga and Vara are considered abnormalities that can cause a limp or a reduced range of motion, resulting in pain and resulting in seeking medical treatment. Additionally, there is the occurrence of femoroacetabular impingement (FAI)

Varying studies have shown that athletes or martial artists/athletes could be exposed to injury constantly due to the repetitive movement of a particular joint, and the risk of hip joint injury due to excess movement range could be high. Therefore, chronic hip pain resulting from FAI could decrease the athletic ability and the close relationship between the FAI and differing sports.



Femoroacetabular impingements were found to relate to sports carried out in an aggressive/intense manner and with repeated movements outside of the physiologic ranges of motion were found in the study. However, there has not been any official paper regarding the relationship between sports activity and the prevalence of FAI

Variable	FAI in athletic patients
Sex (male:female)	122 (78.2):34 (21.8)
Hips	156
Type of FAI	
Cam	86 (55.1)
Pincer	43 (27.6)
Mixed	27 (17.3)
Type of sports	
Soccer	44 (28.2)
Baseball	36 (23.1)
Taekwondo	35 (22.4)
Weightlifting	15 (9.6)
Others	26 (16.7)

Variable	10s	20s	30s	40s
Hips with FAI	22	102	73	101
Hips related to sports	12 (54.5)	63 (61.8)	33 (45.2)	34 (33.7)
Sports				
Soccer	0	28 (44.4)	13 (39.9)	3 (8.8)
Martial arts	9 (75.0)	20 (31.7)	7 (21.2)	4 (11.8)
Hiking	0	0	3 (9.1)	5 (14.7)
Others	3 (25.0)	15 (23.8)	10 (30.3)	22 (64.7)

With this information, we can see potential structural impediments with our students; a simple range of motion test can be carried out for educational purposes only and commenting of assumed issues should not be made. We should refer students and seek medical treatment ourselves.

Self-prescribed treatments can be sought, which are available via multiple sources with potential advisors such as Dr Kelly Starretts Book "Becoming a supple leopard." With various range of motion and mobilisation techniques, Kelly considers Banded flossing the easiest way to deal with muscle stiffness and bring the joint into a good position. And by using a band to create movement through the joint, referred to as "flossing or movement. " This can be directly targeted at the hip joint or through varying ranges of applied torque and other static stretches per examples below.



Students can perform additional static stretches targeting external rotation can be along with the following example can be performed to aid mobility while holding good posture to ensure good spinal posture is maintained



1. Sit upright with your legs straight out in front of you



2. Lean toward your left and post your left hand on the mat for balance. Swing your right leg behind you, position your lower left leg perpendicular to your body, and post your right hand on your left foot.



3. Place your left hand on your left knee, sprawl your right leg back, and lockout your arms, keeping your shoulders back.



4. Keeping your back flat, lower your chest toward the ground.



5. With your right hand blocking your left foot—which prevents your foot from sliding underneath your body and losing tension in the stretch—rotate toward your left side to hit a different corner.



6. Rotate toward your right side and try to get your belly button over your left foot.

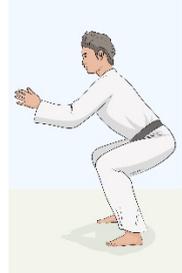
The initial exercises introduced to the club to target specific areas were

Calf Raises

- Plantar Flexion (Gastrocnemius and soleus muscles)

Squats

- Quads
- Glutes
- Hamstrings
- Calves
- Core Muscles



Skipping/ Jump Rope

- Quads
- Glutes
- Hamstrings
- Calves
- Core Muscles



Knees over toes Lunge

- Quads
- Glutes
- Hamstrings
- Calves
- Core Muscles



Once we worked through these Strength movements and the students, they were able to lift and rotate freely as a generalised term. We saw an improved performance in chamber positions pre executing kicks with greater motor control. This was also demonstrated in the management when re-chambering and moving to their next stance with a higher level of accuracy and improved foot position.



Thesis



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The exercises appeared to improve foot position in front kicks, in particular, Apcha bushigi or front snap kick. They were able to flatten out the foot angle and kick with the correct tool.

Initially, we saw a lot of this



Then transitioned to:



Conclusion:

In conclusion, One's human anatomy does contribute to the ability to perform Taekwon-do techniques

Level of understanding of human form and the way we move needs to be considered in its very basic form as to the way we step, and the natural cushioning mechanisms we have will affect our movements with everything we endeavour to take on. Whether it is power breaking or performing patterns, the consideration given will directly relate to all the movements in a biomechanical sense.

Maximum benefit will be obtained by using our bodies in a natural action or motion thus complying with all techniques laid down in General Choi Hong Hi's Encyclopaedia of Taekwon-Do.

Conditioning of muscles and improving in motive skills needs to be carried out in a controlled manner, assessing each individual student separately with only minor generalisations applied. Our modern world of protective footwear can prevent development of basic foot strength and barefoot exercise in our Dojang 's can be challenging for some students.

Mobility of the students' needs to be assessed and consideration made to the teaching methods applied due to age, gender, previous sporting prowess and obvious physical limitations. Hip and pelvis structure can limit abduction and rotation of the femur which can impede the ability to perform kicks above the waist in a form deemed acceptable to our prescribed techniques to the mid and high sections.

Mobilisation of soft tissue can improve range of motion and can be sought through either medical practitioners, trainers or various self-help sources such as Books, YouTube channels, websites and the like.

At Dragons Spirit Wanganui we carried out some mobility and strength exercises such as calf raises squats lunges and skipping when at our Saturday training, each movement was introduced periodically when carrying out our warm up as to not injure or cause repetitive strain injuries.

Success has been observed and with the lack of complaints from students as conditioning has improved along with technique has improvements in general, Allowances have been made and kicking range for the student who has structural constraints to improve form rather than striving for the unachievable.

References:

Lieberman, Daniel E., *Perspective Exercise and Sport Sciences Reviews*: [April 2012 - Volume 40 - Issue 2 - p 63-72](#)

Training Secrets (Encyclopaedia Vol 1 page 80) Gen. Choi Hong Hi

Hip Pelvis. 2016 Mar;28(1):29-34. English.

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