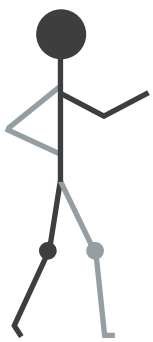
# THE POWER OF THE SINE WAVE

## A BEGINNERS GUIDE TO SINE WAVE IN ITF TAEKWON-DO



BY HAYDEN BREESE

# INITIAL THOUGHTS...

**Hayden Breese**

Taekwon-Do practitioners aim to produce massive power by utilizing the potential of their body. Anyone can achieve their personal potential through intense physical training, mastery of technique, study, and by applying the scientific principles of the theory of power.

Movement and motion in Taekwon-Do occurs when a technique is performed on the spot, when there is a step forward, kick performed or jump for example.

Sine wave is a special way of moving the body in Taekwon-Do. We perform movements with a sine wave motion in order to generate more power with our techniques.

A common misconception is that sine wave is an unusual form of movement. This is not correct. Sine wave is a natural way of moving the body with only slight emphasis on raising and dropping the body.

The following document is designed and worded as simply as possible. The ultimate goal is to give any student of Taekwon- Do the opportunity to understand and put into practice the correct application of Sine Wave in their movements.

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*"slightly low, and high and low"*
*"Always slightly…initially on that level"*

*- Gen Choi Hong Hi, Jamaica IIC 2001*

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# CONTENTS

01

# SINE WAVE AND THE THEORY OF POWER

The weight of your body or “mass” contributes to the amount of power you can produce. Mass is one of many aspects that make up the theory of the power, along with breath control, concentration, reaction force, speed and equilibrium. If you study these items carefully and apply them in your Taekwon-Do training you can improve the power of your techniques.

We can use our mass to increase our power by dropping our body at the moment of impact. In Taekwon-Do we call this a sine wave.

If we watched someone from a side on position perform a sine wave in Taekwon-Do, we would see them slightly lower, then raise, then lower the body as they move. ***A sine wave can be described as the intentional positioning of the body to drop into a movement.*** To achieve this motion may require you to slightly bend your knee or use the balls of the feet to raise and lower the body.

The sine wave is particularly relevant to improving speed and equilibrium, as it helps position the body in a relatively relaxed and balanced position.  For example, the body is more relaxed when the knees and arms are slightly bent.

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*“Slightly down then up.”*

*- Gen Choi Hong Hi, Jamaica IIC 2001*

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# USING YOUR MASS TO PRODUCE POWER

SINE WAVE AND THE THEORY OF POWER

Centre of gravity is a point where the total weight of your body is thought to be concentrated. If you lift your centre of gravity and lower it at the moment of impact you can apply your weight to strengthen your technique.

How you raise and lower you body depends on the kind of stance that you want to use. For example, if you are in a parallel stance you lift the heels off the ground to raise and lower the body and you do not bend the knees. In this case you only use your ankles.

When performing a punch in a walking stance position you soften both knees, while using the bending knee of the rear leg to lower and raise the body. In L Stance and Sitting stance you bend both legs. This may sound confusing but it makes a lot of sense when you try to perform a punch using these stances.

*Another way of increasing body weight is the utilisation of a springing action of the knee joint. This is achieved by slightly raising the hip at the beginning of the motion and lowering the hip at the moment of impact to drop the body weight into motion.*

*- Encyclopedia of Taekwon-Do, Book 2, Theory of Power, Page 29*

BY HAYDEN BREESE

# THE ROLE OF BACKWARDS MOTION

SINE WAVE AND THE THEORY OF POWER

Most of us will be used to backwards motion and how it applies to hand techniques such as a punch. For example, when performing a punch, the hand is moved backwards first before punching forward.* This backwards movement creates a greater distance for a technique to gather speed, and also starts the limb in motion rather than trying to accelerate forwards from a standing start.

The sine wave could be thought of as the backwards motion of leg movement. The 'down-up-down' movement pulls the body down creating more fluid motion.

This loading of potential energy, increases the distance from start of technique to finish and therefore the potential speed and power that is possible.

***This creates movement before forward momentum resulting in more power.***

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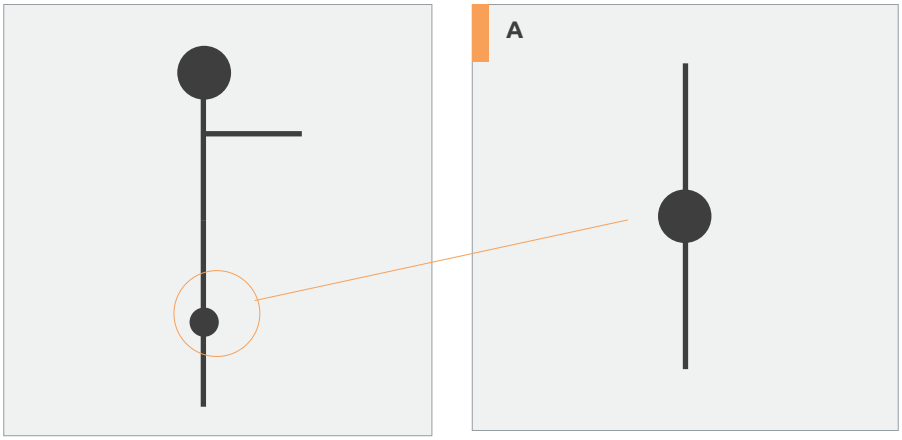
# THE KNEE

## THE KNEE

The knee acts like a spring enabling the body to go up and down. Many of the books about Taekwon-Do call this the “knee spring.” A spring expands and contracts creating force. You can utilise your body in the same way to create power. The body cannot raise itself beyond the vertical potential of legs at full extension. As such vertical movement is achieved through the bending of the knee in many cases.

When you bend your knee your body will drop. When you straighten your knee, your body will rise.




*Knee spring refers to the function of the knee in raising and lowering the body.*

*- Encyclopedia of Taekwon-Do, Book 2, page 72*

# DO NOT FULLY STRAIGHTEN THE KNEE

THE KNEE

The knee does not fully straighten once the movement is in process. Once the movement is in motion it does not stop until completed. If the knee were to become fully straight at any point during the movement, this would result in unnatural movement and a reduction of balance and power.

***The function of the knee***

***Unless the stationary leg remains flexible, the movement will definitely be inhibited and lack smoothness causing difficulty in bringing the hand and foot into simultaneous action due to the loss of dynamic stability. Since the loss or gain of the mass depends on entirely on the knee of the stationary leg, the proper use of the knee spring is the key to this technique."***

***- Encyclopedia of Taekwon-Do, Volume 4, Page 194***

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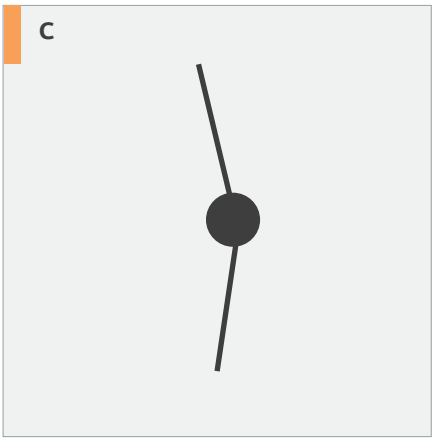


# THE KNEE CREATES STABILITY AND EXPLOSIVE POWER

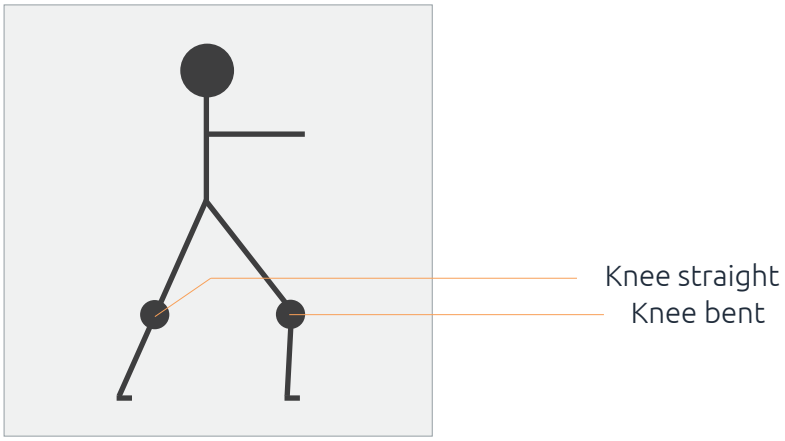
THE KNEE

When the rear knee becomes fully straight in walking stance at the exact same time the punch hits a target, this sudden stability creates a solid position to apply your power.

There is a dynamic and elastic release of mass and power as the knee is straightened.

This dynamic use of the knee also adds explosive power when performing kicks such as the side-kick. Try concentrating on the motion of your supporting knee throughout the movement but always leave the supporting leg bent slightly at the moment of impact.

***The maximum use of the knee spring of the stationary leg should always be employed….the knee of the stationary leg must be bent slightly to maintain the balance at the point of impact, except in the case of a pressing kick.***
***Encyclopedia of Taekwon-Do, Volume 4, Page 11***



03

# THE HIP

## THE HIP

The hip can be used when performing a technique to produce more power. For example, when performing a Knifehand guarding block in L Stance or a forearm low block in walking stance. A jerk of the hip in the direction of the technique is common.

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*Mathematically, the maximum kinetic energy or force is obtained from maximum body weight and speed and it all important that the body weight be increase during the execution of a blow. No doubt the maximum body weight it applied with the motion by turning the hip. The large abdominal muscles are twisted to provide additional body momentum. Thus the hip rotates in the same direction as that of the attacking or blocking tool...*

*- Encyclopedia of Taekwon-Do, Book 2. Theory of Power, Mass, Page 29*

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*Jerk the hip and abdomen throughout the action, slowly at the beginning and sharply at the moment of impact. The hip is jerked slightly before the action in order to concentrate the larger muscles of the hip and abdomen together with the smaller muscles of the four extremities against the target simultaneously.*

*- Encyclopedia of Taekwon-Do, Book 3, Page 11*

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# PERFORMING HAND TECHNIQUES ON THE SPOT

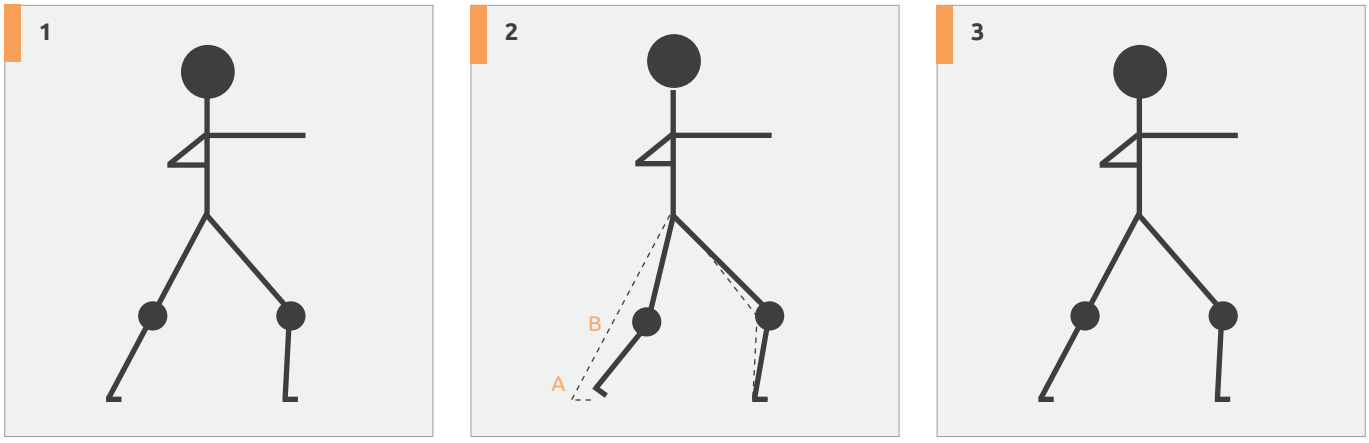
# BENDING YOUR KNEE AND LIFTING YOUR HEEL

PERFORMING HAND TECHNIQUES ON THE SPOT

When performing a hand technique from a walking stance position, A) raise the heel of the rear foot slightly off the ground and bend your knee while softening the front knee. B) Return your heel to the ground and straighten you knee at the moment of impact.

**Walking Stance Example:**
When performing a walking stance technique in normal motion, on the spot, perform a full sine wave. This full sine wave is a movement of the body in a down-up-down motion. To achieve this kind of movement with the body, bend your rear knee to lower the body, straighten your knee to rise with the heel raised off the ground, and then drop your weight into the finished position by lowering your body, placing your rear heel firmly to the ground. The front knee will soften and also bend slightly when performing the sine wave.

The knee of rear leg will be bent slightly throughout this motion but become straight in a walking stance at the moment of impact.



PERFORMING HAND TECHNIQUES ON THE SPOT > BENDING YOUR KNEE AND LIFTING YOUR HEEL

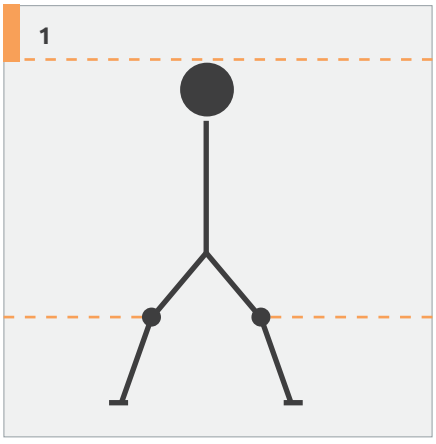
The following points of reference from the Encyclopedia of Taekwon-Do help explain this motion further:

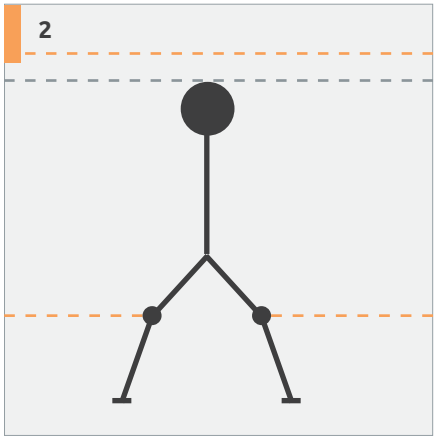
*The heel of the rear foot should be raised slightly off the ground at the beginning of the motion and placed firmly on the ground at the moment of impact in most cases. This principle, however, is only applicable to those movements, which are performed from the same position.*

*Raise the body slightly at the beginning of the motion, and lower it at the moment of impact in all cases.*

*The heel of the rear foot must be played firmly on the ground at the moment of impact for both attack and defence.*

*Encyclopedia of Taekwon-Do, Volume 3, Hand Techniques, page 10.*



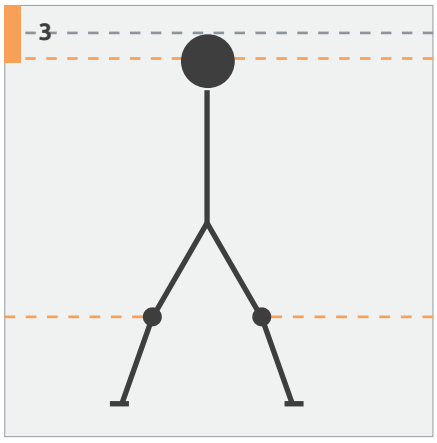
PERFORMING HAND TECHNIQUES ON THE SPOT > BENDING YOUR KNEE AND LIFTING YOUR HEEL

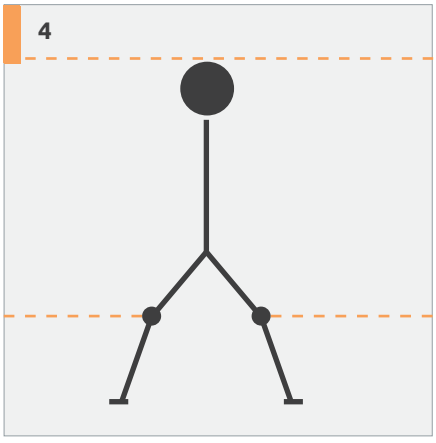
**Sitting Stance Example:**

Assume you are in a down position after completing a punch.
To perform another punch, soften both legs at the same time. You go down slightly, then up (but do not completely straighten your knees), then drop down to the original position as you complete the punch.
Note: unlike walking stance you do not lift the heels off the ground in sitting stance.

**L Stance Example:**

This stance is similar to sitting stance in that you do not lift your heels off the ground. Assume you are in a down position after completing a punch. To perform another punch, bend both legs at the same time. The rear leg will bend more because it is holding more of your weight. You go down slightly, then up, then drop down to the original position as you complete the punch.



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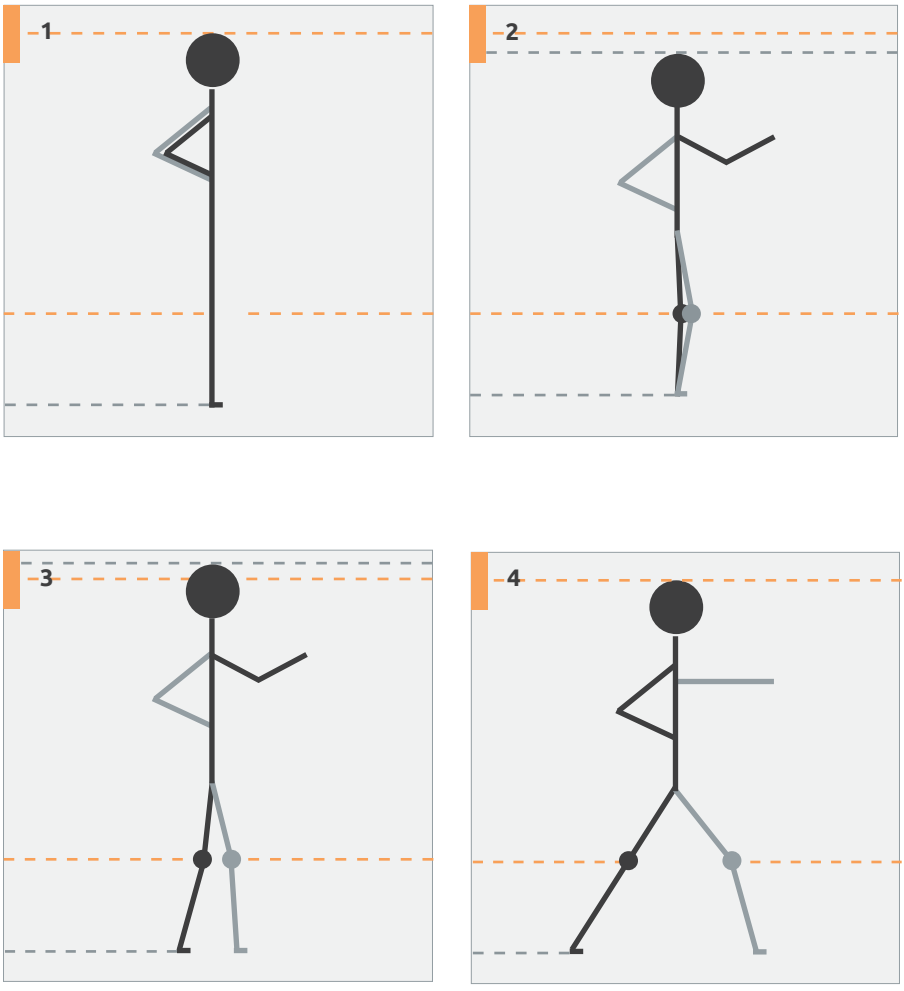
# SINE WAVE AND STEPPING

# MOVING INTO WALKING STANCE FROM A PARALLEL STANCE

SINE WAVE AND STEPPING

If you are starting from a stationary position, shift your weight to one leg. At the same time raise the arm on the same side. Bend and straighten your knee on this leg in order to go down, then up, then move forward and down into your movement, moving the other leg.



# HOW TO TAKE A STEP FORWARD

SINE WAVE AND STEPPING

When discussing Sine Wave it becomes important to consider the basic principles of stepping in Taekwon-Do.

*1. The body must always be half facing the opponent when stepping backward or forward.*

*2. The body usually becomes side facing the opponent when stepping sideways.*

*3. The knee spring of the stationary leg must be flexible and relaxed while stepping.*

*4. The foot should be moved smoothly, leaving about one centimeter from the ground or floor except in a rear foot stance.*

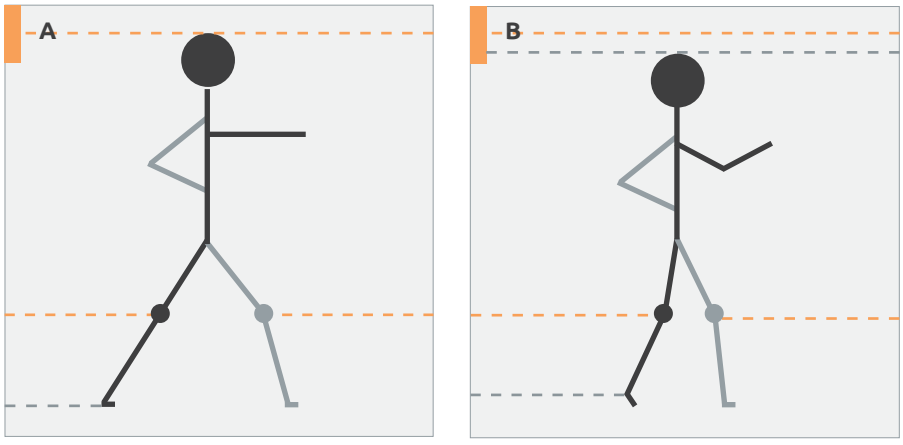
*5. The foot should not be dragged or lifted unless absolutely necessary or advised by the instructor.*

*6. Keep both legs slightly bent throughout the stepping.*

*- Encyclopedia of Taekwon-Do, Volume 4. Page 194.*

*Relax, go forward, down then up, then down.*

*- Grand Master, Hector Marano, NZ IIC, 2004*

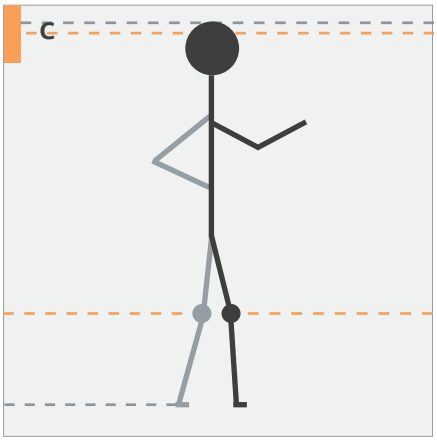


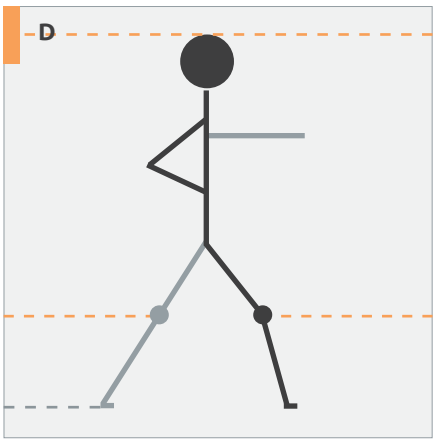
# WHAT IS A FULL SINE WAVE

SINE WAVE AND STEPPING

The full sine wave is a term given to the movement of the body in a forward, down-up-down motion. To achieve this kind of movement with the body, bend your knee to lower the body, straighten your knee (but not fully) to rise and then drop your weight into the finished position. This is slightly different to the on the spot exercise, because you move forward from your position slightly before starting the down-up-down motion of the sine wave.

You need to move forward from your position before starting the down motion or else your sine wave will not align with the intermediate position of your movement. Aim to have lowered your position and be on the rise by the time you reach the intermediate point of your movement. In this way you can complete the sine wave by dropping into the technique.



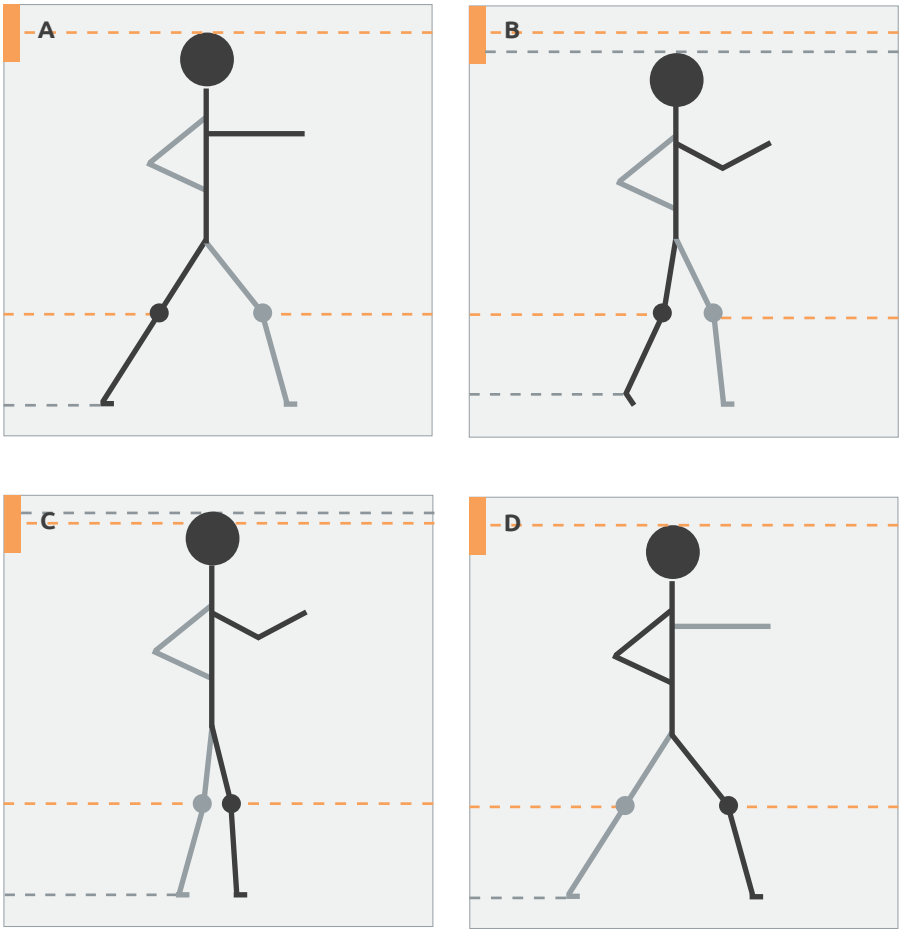



# MOVING IN WALKING STANCE OR L STANCE FROM AN EXISTING POSITION

SINE WAVE AND STEPPING

If you are starting from an existing stance, move forward from your position. As you do, allow the supporting leg to bend at the knee slightly, then raise by straightening the knee*, then down again to finish the movement.

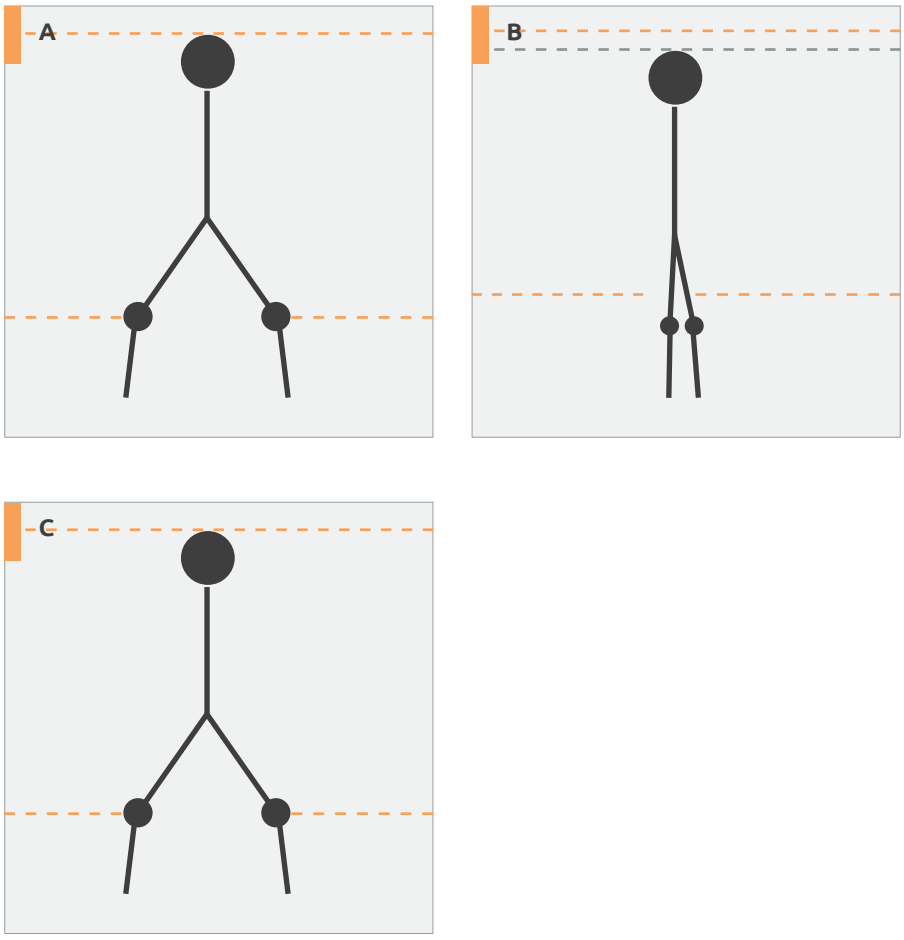
***Note, do not fully straighten the knee during the movement.***



# MOVING IN SITTING STANCE

SINE WAVE AND STEPPING

Sitting stance is interesting because in order to move sideways you have to take two steps, either a step together, step in front, or behind. Both legs soften throughout but as the weight is exchanged to the new leg at the intermediate position, this leg performs the down-up-down motion of the sine wave.



# MOVING TO BENDING STANCE

SINE WAVE AND STEPPING

When we step together to form a bending stance from another position, step naturally to position the supporting leg on the ground in the desired position. The other leg that will be raised up, no longer has any weight of the body applied to it.

As the weight transfers from one leg to the other, the new supporting leg starts to bend naturally, performing a down-up-down motion. During the down motion of the sine wave, drop the body down into the bending stance as you complete a guarding block for example.  While dropping raise the other leg and position the foot beside the knee of the supporting leg. Example, between movements 6 and 7 in pattern Won Hyo.

Sometimes a bending stance is formed with out stepping the feet together. In this case, a sine wave is performed in the usual forward, down-up-down motion. Example, between movements 26 and 27 in pattern Won Hyo.

It is very difficult to compress the knee the further you are away from the equilibrium point. So most sine wave vertical motion occurs close to the intermediate position when completing step turns or when moving into bending stance.

# CHANGING DIRECTION

SINE WAVE AND STEPPING

If you want to change direction and/or stance, first move naturally from your current position into the intermediate position of the next technique. The sine wave is spread over the entire movement as we transition our direction but much of the sine wave motion occurs once we have balanced our weight on our supporting leg. This naturally becomes close to the intermediate position.

Imagine that we took a photograph of your movement when performing a technique. We would call the half-way point the intermediate position. At that point of the movement the hands are often crossing. This intermediate position is also the point at which the body is at its highest point during the Sine Wave motion. Therefore, the next stage of the movement is to drop the body into the technique.

**Example: Walking Stance Step Turn**

You will notice that it is impossible to perform the sine wave until your weight is balanced. This means the leg that takes your weight needs to be in a stable and balanced position in order to perform the sine wave. If is not your sine wave will not be effective. In most cases therefore the sine wave occurs close to the intermediate point of the movement.

***Why not go up then down?***

***In going up without the down, we risk the knee becoming fully straight at the top of the movement. The first down motion allows for the knee to go comfortably up and down resulting in a fluid motion of the body.***

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# APPLYING THE SINE WAVE TO TAEKWON-DO PATTERNS

There are several different types of motion in Taekwon-Do including fast, continuous, connecting, releasing, and slow. Fast, continuous and connecting motions utilize different types of Sine Wave. These motions describe different ways of conducting speed, breathing, and sine wave in pattern movements.

# SPEED

APPLYING THE SINE WAVE TO TAEKWON-DO PATTERNS

In Taekwon-Do we can perform movements fast. That is with aggressive urgency linking movements together without a pause. These types of movements are often attacks. We can also link defensive movements together by removing the pause between the movements and sine waves - we call this continuous motion. This creates more flow and beauty especially for defensive movements. Movements of course can also be done in slow motion, which helps emphasise breathing, balance and precise positions of technique.

# BREATHING

APPLYING THE SINE WAVE TO TAEKWON-DO PATTERNS

We let out a short exhale of breath at the precise moment of completing a technique. However, when linking movements together, sometimes a continuous exhale is used while in motion across multiple techniques.

# SINE WAVE

APPLYING THE SINE WAVE TO TAEKWON-DO PATTERNS

Sine Wave can be applied differently depending on the motion of one or more techniques. Over the next few pages I will describe how to conduct Sine Wave using three different types of motion - fast, continuous and connecting.

*Continuous movements always involve defence - and the idea is to link them smoothly with a nice flow and rhythm. Fast techniques are normally attacks, nearly always punches and kicks (but not always - Yoo Sin 34-35).*

*Paul McPhail, Sine Wave Study, 2004*

# FAST MOTION

APPLYING THE SINE WAVE TO TAEKWON-DO PATTERNS

Fast motion is one or more movements performed with urgency.

In most cases, when performing fast motion in patterns, perform an up then down motion to complete the next movement. For example, in Do San, movements 15-16, we don't go down between movements. As the leg is already straight when performing the first punch, we have no potential way of raising the body using the knee spring, so in this case we use the ball of the foot to raise the body like a parallel stance.

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Breaths: One breath for each movement
Sine Wave: **Up then down**
Gap or Pause: None

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*"fast motion is performed with urgency, - aggressive."*
*- General Choi Hong Hi*

*"We do not have time to do complete sine wave, so we do half sine wave"*
*"You do not have time to go down again, so only go up"*
*- ITF Technical Committee*

*"If you watch, there is no gap at all between the two punches in Do-san for example... as soon as the first is finished you spring straight up into the 2nd..."*
*- Paul McPhail, Sine Wave Study, 2004*

# CONTINUOUS MOTION

APPLYING THE SINE WAVE TO TAEKWON-DO PATTERNS

Continuous motion is two or more linked movements performed in a flowing, continuous nature with a long breath.

In most cases*, when performing continuous motion in patterns, perform a full **down-up-down** motion to complete the next movement. For example, in Dan Gun, movements 13-14, low block and rising block.

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Breaths: One continuous breath across both movements, with emphasis on each movement.
Sine Wave: **Down-up-down**
Gap or Pause: None

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*"Continuous motion is performed with grace and beauty - it must flow."*
- General Choi Hong Hi

* In black belt patterns Po-Eun, movements 6-12, 24-30 (blocks, punches) and Yoo-Sin, movements 16-17, 18-19 (hook, punch), 20-21, 25-26 (pressing/rising), there are continuous motion movements without the down movement as it is not possible. In this case continuous motion becomes, **up, down.**

# CONNECTING MOTION

APPLYING THE SINE WAVE TO TAEKWON-DO PATTERNS

Connecting motion is two hand movements performed together.

In all cases, when performing connecting motion in patterns, perform two hand techniques together with a full Down-up-down motion, and one breath. Do not pause between the movements. For example, in Yul Gok, movements 16-17, hooking, punch. The first hand movement is performed on the completion of the up part of the motion and the second movement on the completion of the down part of the motion.

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Breaths: One breath.
Sine Wave: **Down-up-down**
Gap or Pause: None

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# FINAL THOUGHTS...

Taekwon-Do is both an art and a science. Seek knowledge, apply it as best you can, and be mindful of what you are doing and why you are doing it. If you can do this, then I am sure you will certainly master Sine Wave through trial and error.

Sine Wave is an important topic in Taekwon-Do, as it is involved in many aspects of the art and is a fundamental way of moving the body. This beginners guide contains many of the basic principles of Sine Wave needed to perform Taekwon-Do.

I hope this reference guide has helped you in your training and I wish you all the best in your Taekwon-Do journey.

**Hayden Breese**

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