

Balancing to Perfection

4th Dan Thesis

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Introduction:

Balance. Quite a small word really, but such an indispensable and intricate part of our daily lives, and something that most of us take for granted. Perhaps not even realising how important it is to us in everything that we do, as we shall see later on.

Balance in Taekwon-Do is no different, except that perhaps it is one of the most essential elements. I often tell students that if they spent just 5 minutes a day practising standing on one leg in different positions, it would improve their Taekwon-Do a hundred percent almost overnight.

Balancing perfectly is not difficult or even complicated. We do it everyday while walking, standing, and even while sitting in a chair or on the ground. Balancing while performing patterns, sparring, breaking or otherwise doing an activity that is outside of our daily movements is more difficult, but again not hard and as with everything else in Taekwon-Do, a little practise goes a long way.

I will show you how perfect balance can be achieved in Taekwon-Do very easily, or as near to perfect as you can get.

If you just want the exercises, go straight to the end section. However, it's important to realise why it is that you need to practise them, how each one helps, and what you are practising them for; and only reading the entire article will give you that.

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Balance, how does it work?

What is balance?

Balance is the body's ability to coordinate its movements to and from any given position.

In short, this simply means that in order to move your body you must be able to control the muscles involved and know where your body is positioned at all times; this is essentially balance. In order to walk, kick, jump, or anything really, you have to do exactly the same things. All these movements involve complicated processes, it's just that some appear simple or are now a reflex movement due to continual practise. Try walking without swinging the arms, it just feels different, strange, or even abnormal. Try swinging the arms in the opposite manner you normally would. For example when you walk forward with the left leg you normally swing the right arm. This happens so you can counterbalance the bodies tendency to turn slightly to the right. By moving the right arm forward you help the body to remain forward facing. If you swing the left arm, things go haywire and the upper body twists quite a bit to the right, and it's difficult to walk normally. Some uncoordinated new recruits to the armed services have this problem when they first start their basic training course; naturally it's quite amusing to everyone but themselves. Instructors in Taekwon-Do also come across students who are unable to coordinate their bodies movements well.

These simple movements and many others are all learnt when we experience life as a child, and as we grow we learn how to move our arms, how to grab objects etc. It takes quite a lot of practise for a baby to be able to pick up an object. They have to see the object, then move their arms, hands, and fingers in a coordinated effort to pick up the object, all controlled by the Cerebellum, which is the part of the brain responsible for fine motor skills.

Fine motor skills are defined as small movements, such as finger movement, pushing buttons etc. Gross motor skills are just the opposite and involve large limb coordination, such as walking. Sometimes a brain injury can result in having to learn these things all over again as an adult which I will discuss in a later chapter.

It's all of these movements that can be defined as balance. Even while you are sitting, you are balanced, whether it is sitting on the floor, a chair, or a bar stool. If you were to relax all your muscles, especially the ones keeping you upright, you would fall over. In fact just about the only time you aren't practising balancing is when you are lying down or sleeping.

Balancing systems:

There are 3 main systems involved in balancing. (In fact there are 4, but it is much simpler if we use the three main ones)

They are your sight or vision, central nervous control, and inner ear balance.

Balancing by sight:

Sight or vision balance is the main system used by the body to balance correctly in any situation, except of course when you close your eyes. Interestingly enough, the visually impaired amongst us have excellent balance. This is because they have practised using the other two systems as they are no longer able to use their eyes.

Vision is the system that we use the most and not just for balance. It is our biggest and most important sense and in fact over half of our brain is devoted to interpreting the things we see with our eyes.

So for most of us, our sight is the most important part of our ability to balance. This is why we should not look at other people when we start practising our balance. If they lean too far and fall over, we will probably do the same thing as well.

Balancing by muscular control:

The central nervous system which covers the body's movements and muscle control, called posture, is the second balancing system.

Our bodies contain proprioceptors. These are sensory receptors located in the muscles, tendons, and joints that are sensitive to stretching, tension, and pressure. By rapidly relaying information to the conscious and subconscious nervous system, proprioceptors give us a sense of what our bodies are doing. Whether we have raised our arm, and how far it is raised, if it is bent, and how much tension is in our fingers when we grasp an object etc. If you close your eyes and remove the primary vision system and then raise your arm, you can tell almost exactly where it is, and what it is doing. Try closing your eyes while sitting at the table. You will be able to remember exactly where the edge is and place your hand right on it. Or try closing your eyes and touching your nose, or your ears etc. This is your brain remembering each object, or body part, and using the signals from the proprioceptors to guide your hand to the right place. You will have the most success touching things like your nose and ears. This is because you carry them with you, and know how far your arm has to bend to touch your ear or scratch your nose and you don't need your eyes for this.

Balancing by the inner ear:

And of course there is the inner ear, the third balance system. This is the system, which like the eyes, tells the brain where the body is in relation to its environment, eg leaning, standing tall, upside down etc.

If you stand up, close your eyes and lean over, the brain will know you are leaning because the inner ear and your muscles tells it you are, and without your visual input the brain now relies mostly on the secondary systems, the inner ear and the central nervous system.

The inner ear is a very complicated system, so let's simplify how it works a little. If you can think of the inner ear as a long tube which is wrapped around itself in all directions and filled with fluid with millions of tiny hairs poking into it that measure the movement of the fluid as it swirls around when you move, it becomes simple. Each hair moves with the fluid movement which in turn is caused by the body's movement. The brain measures what each hair tells it and this is how we know whether we are moving or leaning or bending over etc. Of course this all happens subconsciously, all we know is that when we close our eyes, we can tell when we are leaning, moving etc. Truly the brain is a marvellous piece of evolution.

There are several ways to confuse the inner ear and the brain. One is to close your eyes while leaning slightly and very slowly. If you stay there for a while, it becomes difficult to tell whether you are standing straight or not. Open your eyes again and your sight immediately fixes the problem.

The other of course is to spin round and round a lot. This usually results, for most of us, in a feeling of dizziness and in some cases you can be sick if you keep it up for too long. This happens because when you stop moving or spinning suddenly, the fluid in your inner ear continues to move for a little while, fooling the brain and confusing it as your eyes say you are no longer moving, but your inner ear says that you are. The feeling gradually goes away as the fluid settles down, although often the sick stomach feeling takes a lot longer.

An immunity to some degree can be built up to this dizziness and most of us know that children can tolerate more spinning than adults. This is because they do it more than we do. Taking a look at Ballet dancers, it is easy to see that they have great balance, and are able to spin around for what seems like forever, without suffering any balance loss or dizziness. This is the result of years of practise as well as a great technique of moving the head faster than the body and then stopping it suddenly before repeating the process, enabling the ear to settle between each spin and the eyes to focus on a stationary object long enough to stop the conflict between the two.

So in summary, these systems all working together inform your brain of how your body is positioned no matter where it is and how it is moving and simply, that is how you balance yourself. This is of course a simplified version, but it gives us the background information we need.

Balance, drugs & alcohol

Alcohol interferes with your balance by affecting the Cerebellum, which you will remember is the part of the brain that controls muscle movement. As the muscular electrical control is interfered with, it becomes harder for you to tell your body to move in the way you want it to, which results in you experiencing difficulty in staying in control of your balance, and in some cases, results in you appearing 'falling down drunk.' The inner ear is still working 100%, however the brain is not and it simply cannot keep up with the signals it is being fed from the eyes, ears, and the bodies muscles.

Drugs work in much the same way. Different drugs affect different parts of the body in different ways. However they all have the same end result, which is an interference in the bodies normal workings, or abnormal workings as the case may be, and depending on the drug, this can affect balance. This is one reason why some drugs say not to drive after taking them etc.

Obviously it would be unwise to be on medication before a grading or a competition, or even at normal club training, depending on the medication of course. Even days after drinking, especially if you drank more than usual or were especially intoxicated, this could still effect your balance at training, not to mention still feeling sick.

Balance at different ages

We have all observed in a class of students how the senior students at the front have much better balance than the beginner students towards the back, regardless of age. However if you look closer you will see in general that younger students lack the finesse and the degree of balance that an older student of a similar developmental training time has.

This is because that as an adult, we have spent more time practicing with our body and are more accomplished in controlling its movements. This age developmental problem for balancing can be overcome to a great degree for younger students with a little practice and a little concentration. Taekwon-Do for young students is not an age thing, it's a concentration thing. Anyone that has worked with young children will know that if they have their mind focused on what they are trying to achieve, they will be much better at it than a student that starts because Mum or Dad think it's a good idea. I recommend you read Mr Atutahi's article on Training Children and Mr Kraiger's Children's Motivation Programme, both of which are on the ITFNZ website in the reference material section.

Below is some information on the developmental stages of children aged between 3 to 5. It shows the vast changes that occur in the motor skill level between toddlers at 3 years of age and a child of 5 just starting school. The kicking part of the 5 year olds motor skill level is of value for us, as it is integral to Taekwon-Do. That is not to say that children below 5 cannot kick, just that in general they will have difficulty with it. My grandson at 20 months can stand on one leg and kick a focus pad, although he sometimes falls over. The great thing is that Taekwon-Do improves these motor skills immensely for younger children, and especially their balance.

Developmental stages of pre-school children

Three Years old At this stage a child has difficulty with independent limb movement, shows wide flexibility in range of joints, walks with automatic gait, runs with increased smoothness, walks on a balance board, balances on one foot for an instant, alternates feet going upstairs, jumps off a low box with both feet together, throws an object with total body involvement, catches an object thrown directly into stiff outstretched arms, and shows readiness for riding a tricycle.

Four Years old At this stage a child controls independent movement of body parts, shows increased spatial orientation, has a near adult style walking gait, shows increased smoothness when running, turns corners quickly, accelerates, decelerates and stops running motion, begins alternating feet while walking on a balance board, begins mastery of galloping skills, throws with arm only, relaxes arms as they move to catch an approaching object, and begins to control a bouncing ball.

Five Years old At this stage a child shows increased control of fine movements, has increased endurance, uses running skills in play activities, has improved motion balance, has refined climbing skills, skips, gallops and jumps with smoothness, attempts to master hopping with increased sense of balance, shows rapid improvement in throwing skills, begins to move body to catch an object, begins to control a bouncing ball with one hand, shows increased leg backswing, follow-through and appropriate trunk rotation when kicking.

Source : MacDonal, S. (1997) *The Portfolio and Its Use : A Road Map for Assessment*.
Southern Early Childhood Association

Developed stages of adults

As we grow older, our experiences in general life continue to build and assist in the control of our own bodies to such a fine degree that by our early teen years, a great degree of balance can be obtained. Children often go through a 'gangly stage'. This is when the child suddenly grows 2-3 cm's in a very short space of time and it seems they cannot control their bodies properly. They can be clumsy, unable to jump very high or run very fast etc. This is usually only for a short period of time and it seems one day they suddenly experience a breakthrough in the control of their bodies. They start to run faster, balance better, and amazingly the same things happen to their brains, although sometimes you wouldn't know it!

Their bodies start to lose the so called puppy fat and their faces lean out and change seemingly overnight. Muscle control is greater and coordination suddenly seems to sort itself out.

This all starts happening around their early teen years, and for the child it can be a very frustrating time. Their instructor is telling them to jump higher or balance better, but no matter what they do, it doesn't seem to help. Then all of a sudden, everything starts to work better, it's like someone turned the switch on.

Our body's ability to balance starts to decline in most people at about the age of 25 (*Steven L. Wolf, MD, a rehabilitation medicine specialist at Emory University in Atlanta, http://my.webmd.com/content/article/11/1676_50445.htm*) due to the bodies own breakdown in muscle control and strength, what we call 'old age'. It's funny to think of 25 as old, however that's when we are supposed to reach our body's peak, of course it's not the same for everyone.

The effects of old age can always be fought off with different exercises for a while and the benefits of exercise for everyone no matter what age or stage they are at is well known. There will come a time however, when no matter what we do, our balance will start to deteriorate as we get older.

Students that start Taekwon-Do in their later years will experience muscle control problems in exactly the same way a younger student experiences them, and again this is simply that they haven't done this kind of coordination of movements before. Within reason, a lot of the flexibility and muscle control that is gradually lost as we get older can be regained, and I specify within reason. Flexibility can be improved, and so can balance, but there are limits and you should always listen to your body; it will tell you when you are about to go too far!

Instructors should also be aware that with older students, they are unlikely to ever gain the same flexibility as younger students, and this is also the same for balance, unless of course the older student has kept their body fit and supple by other forms of exercise. While you can't say that older students have a disability, they do have a disadvantage in starting Taekwon-Do later on in life. But as with all things, determination and practice can overcome most barriers, and great balance is no different.

Balance, injury & disability

As previously mentioned, damage to the brain can result in the loss of motor skills. And the extent of this depends on the seriousness of the accident. Some people have had to learn to walk again, others to talk. Some people have had to start over again in every area, almost like being reborn again but as an adult. Serious stroke sufferers can suffer a left or right side paralysis, which can result in permanent muscle control problems. Sometimes spending many hours in physical therapy can assist them in regaining some form of control, but of course this depends on lots of different things.

Having to learn how to move your legs again, to walk, or to talk must be unbelievably hard. Fortunately in Taekwon-Do, the limits of your body do not prevent you from learning to defend yourself. The degree of self defense achieved will only be affected by the desire to master what aspects of Taekwon-Do you are able to physically achieve. Some instructors have had students with one leg, or one arm, or suffering from muscular dystrophy etc.

I have taught 2 students who as 10 and 12 year olds were unable to distinguish their left from their right, and had ranging degrees of difficulty in coordinating their limbs in the same way most of us can. Dyslexia in an extreme form produces the same affect.

This presented quite a challenge, but after only a few weeks training, both showed a marked improvement in the control they were able to establish over their own bodies, and in which side of their body they were using or moving. Unfortunately their desire to continue training wasn't as great as their results, but it was awesome to see how much each improved while they did train.

Taekwon-Do is a great way for someone recovering from a brain injury that has affected muscular control to be able to assist in regaining that control back. Of course a doctor or physio/occupational therapist must be involved for obvious reasons. When an injury results in the loss or partial loss of a limb, the bodies balance is also affected. Compensation for this can be quickly achieved with practice, sometimes to a fine degree.

When I was staying with friends in Dargaville many years ago I was awakened each morning at 5am by a thumping noise that I could hear coming down the street. It would stop outside my bedroom window for 5 mins or so, then just when I was drifting back to sleep, it would start up again, only moving away. Turns out it was a guy who had lost his leg in a car accident some years ago. He was an avid jogger at the time and even with one leg, he found he just couldn't give it up, except now he hopped. The guy still managed 3-4 k's a morning on one leg, although he had to rest half way which just happened to be outside my window. Now that's commitment. Of course, how do you kick with one leg? I guess nothing is impossible, where there's a will, there's a way etc.

Patients that have lost their big toe in an accident, or burns victims that have had fingers replaced with toes will also experience some difficulty walking initially, but as with everything else, practice is the key. The body uses the big toe to 'push off' the ground as we walk forward, and its loss will hinder this to some degree. But contrary to popular belief, the loss of your big toe will not prevent you from walking properly again.

Injury, disability or a special needs situation should not become barriers to learning Taekwon-Do. To my thinking they would make the achievement of a successful grading all the sweeter, as the effort required is greater than for the rest of us. And for instructors, this situation would present a challenge, and consequentially a greater sense of satisfaction in overcoming these challenges. I will cover how the loss of a limb affects balance in the next chapter

The mechanics of balance

So far we know how the body is able to tell if it is leaning or falling etc. And we also know that the Cerebellum is the part of the brain that coordinates muscle movement.

So when we stand up straight, our eyes and inner ear tell us that we are doing just that, standing up straight. But what happens if we want to then extend our right leg into a simple front snap kick in slow motion. How do we do it?

Well, that's when a lot of really interesting things start to happen, and some of them are subconscious.

I have simplified the following process so that I am talking about it's relation to balance and while it's not medically technically correct, it's easier to understand.

Firstly the brain, our conscious thinking self, informs the Cerebellum, our unconscious self, that we are going to perform the task selected. Which in this case is a front snap kick in slow motion from a standing position. The Cerebellum then commands the muscles involved, and there are a lot of them, to do the kick, and this is the subconscious part. You don't tell each muscle what to do, you just 'think' it to all happen, and like magic, and if you have practised the movement, it seems effortless. The eyes and inner ear work with the Cerebellum to prevent us from falling over while we are balancing on one leg, and all three systems complete the task together.

This is what happens in an accomplished student after several years of training. However in a beginner or a younger student, there is a whole set of different problems involved. Firstly the student has not practised the movements required, so the muscle strength is probably not there. Also in the same way we walk well after many years of practise, when we have to stand on one leg and extend the other, this becomes a foreign activity that we have not practised. And so we begin to wobble and loose balance.

This is not to say that our eyes and inner ear are not working, they are working fine. It's the connections in the Cerebellum related to this particular movement or sequence of movements that are not established well enough yet to allow fast enough compensation for our body starting to lean one way or the other. And of course without muscular strength to complete the required movement, the whole process is shaky. The inner ear and our eyes quickly tell the Cerebellum that we are starting to lean, but the Cerebellum is unable to correct the lean fast enough through unpractised muscular control, and so we loose our balance. Simple as that!

After much practise, these electrical connections are well established in the brain and as if overnight, we are suddenly able to balance while performing a slow front snap kick. This process is the same for every movement in Taekwon-Do, as it is for every movement we do involving the coordination of our bodies some 650 separate muscles. This is also why just because you can do a slow front snap kick, you cannot automatically perform a slow side piercing kick, as there are different muscles involved. For some kicks the muscles are the same however and practising one certainly aids in the performance of the other.

As you perform one balancing act, your body will learn where to place the arms, or the head etc in order to compensate for another part of the body, in this case the leg, being extended outwards from the centre of balance. We can see that if the leg is to be extended outwards from the body, an amount in proportion to the legs weight must be extended in the opposite direction as compensation for the change in weight distribution, or we will start to fall over.

All this is simply the affect of gravity working on our bodies. We need muscle control, not inner ear or visual balance reference points. Astronauts leaving for space experience trouble with their inner ears, dizziness, and sometimes vomiting. And in complete unfairness, they experience the same problems returning to earth due to muscle wastage caused by the lack of gravity, and because they haven't been using their inner ears or their eyes for balancing.

This essentially is the essence of balance. And it all comes down to one word... practise!

Our centre of gravity

In class we often hear our instructors talking about our centre of gravity. This is a point on our body that lies in the exact middle of all of our bits and pieces at all times, as gravity is a constant force.

If we were to curl up in a ball, our centre of gravity would be near the centre of that ball. If you also imagine lying down on your back on a balance beam, perpendicular to the beam with your legs extended and your arms by your sides so that you were balanced like a seesaw, your centre of gravity will be approximately half way between your toes and your head and in the middle of your body both vertically and horizontally, right where you were resting on the beam. However if you were to then extend your arms back over your head, you would start to tilt backwards as your centre of gravity would start to move towards your head and you would still be trying to balance in the previous position on the beam. The same effect can be seen by bending the legs so they are no longer straight and as long. This movement of limbs to coordinate balance is something that all children have to learn, and something we often take for granted.

So we know that extending the body or a part of it in one direction must be compensated for by an equal shift in an equivalent amount of weight in the opposite direction. This is to keep the centre of gravity where it should be, which is in the centre, or we will begin to lose our balance and have to shift our feet or equivalent supporting limb etc. Understanding this makes performing a simple front snap kick easier. When the leg extends for the kick, we simply lean away from it slightly to shift the same amount of weight in the kicking leg backwards, and that's basically all that needs to happen to maintain balance for the movement.

The one exception to this is if we perform the kick or movement so quickly that we don't need to move. An example of this is the front snap kick in Yul Gok. The kick is supposed to go out and back fast anyway so this is a good excuse to practise speed, the most important factor in the theory of power. It is the kinetic energy that moves in the two directions, out and back, that if done fast enough, cancel each other out and enable you to stay balanced without shifting the body's weight. This all changes of course if you hit something with your kick, like the practise pad, or an assailant.

When we move up in the grades and the time comes to perform a reverse turning kick, understanding how to lean the body one way to compensate for the leg extended during the spin becomes easier as well, although in practise this generally takes longer as there are more forces at work during the spin, i.e. a spinning limb increases in weight the faster it spins and therefore so must the amount of weight moved in the opposite direction to compensate for it. This is why you will fall to one side during this kick until you learn which way to lean, how far, and at what time during the spin and for different spin speeds. It's a complicated kick when you consider all this, and you should feel well satisfied when you achieve this kick to some degree of competence.

In summary, these are the simple mechanics of balance. Move a limb in one direction while balancing on the spot and you must compensate for the weight change, or the centre of gravity shift, by moving the same amount of weight in the opposite direction.

Balancing on objects

Why is it harder?

Moving surfaces affect the three main different areas of balance control and are just another complication for the brain to deal with. As with anything else, this problem can be overcome with practise. The Circus is full of people that have awesome balance and control over their own bodies and the objects they juggle or balance on. They are able to do this with lots of practise and an element of natural talent as well.

Balancing on a moving object is not difficult; surfers do it, skateboarders as well. And of course, we all learnt to ride a bike! And just because you can juggle, or surf, or skate, or even ride a bike, doesn't mean you can balance on one leg in an extended sidekick position, as they require different muscles and different positions.

So why do we find it harder to balance on a chair, or a balance beam, or a pole extending between two tall buildings like in an episode of 'Fear Factor', and why is it so scary?

Part of the reason is the fear of falling, or specifically the fear of heights (Acrophobia). For those of us that don't suffer from this fear, we encounter the next stage, and it has to do with the eyes.

As we walk and react with our environment, the movements and motions become natural, which is to say that this is the norm for us. Applied to Taekwon-Do, as we train and learn our fundamental movements and patterns, the same thing happens. When we stand up and walk, our eyes record our position relative to objects around us, such as a building wall, the ground, other people etc.

If we were to stand on a balance beam, only one metre off the floor and walk normally, we should have no problem, after all it's only one metre off the ground right? However this is not the case. Walking on a balance beam is the same as walking in a straight line on the ground. However there are several problems for us that start to have an affect immediately.

One is that our brain knows we are no longer on the ground, and for safety sake it makes us look where we are going, in case we step wrong and fall off. This is not really a problem on a balance beam, but it is a problem on a cliff top, so the brains reaction is a defensive one of self preservation.

The other problem is that our brain is used to looking at objects on the ground as we walk or stand from a set distance above the ground, which is our own height. It has grown used to our personal height over many years, and for those of us that wear high heels, our brain and eyes have also gotten used to this small change in height on occasion.

So how does it all work?

Our brain triangulates the changes in distance from our eyes and the objects we are looking at constantly. In other words, our brain knows how far apart our eyes are, and it uses this simple trigonometry to work out how far an object is relative to our eyes position. This is why someone with impaired vision or the loss of binocular vision (reduced or loss of vision in one eye) will

have to work harder to balance as well as someone with both eyes working normally. Also, depth perception is compromised.

Try closing one eye and reaching out for different objects, it is difficult at first and provides a strange sensation, sometimes you will reach too far or not be able to touch the exact spot you could before. Obviously the further away an object is, the harder it is to work out how far away it is. This effect is most noticeable at sea, where there are no landmarks to tell you how far away the land is, or an island etc. Sometimes in a boat travelling towards or away from the land it looks like things don't change, then all of a sudden you are right up close or really far away from something. This is also the reason you get motion sickness, as the eyes don't have something that isn't moving to focus on, which is why you are supposed to look at the horizon when you feel motion sickness.

So how does all this change when you are back standing on the balance beam, getting nervous about falling off?

When we stand up high, like on a beam or chair, our brain has to adjust to the greater distance we are now above the ground, something it isn't used to doing. And the higher we go, the more difficult it becomes to judge the smaller changes in distance when we do simple tasks. Like for instance just standing still without leaning to one side, something that on the ground is so simple you don't even notice you are doing it, but standing on the balance beam it all becomes much harder. And depending on how long it takes to adjust to the increased distance above the ground, it can and will affect your balance.

By not looking down, the problem with the primary balance system, your eyes, is alleviated. However this does not solve the brain's dilemma on the safety issue, and it is difficult not to look down without practise. If you walk up high on a much wider beam and look ahead, not over the side, the brain is not as worried about falling, eg on a bridge. Walking on a metal pole takes a lot more practise, and the higher you go the harder it gets, until of course you reach a point where it doesn't matter how much further you go, the eyes are too far above the ground for them to be able to tell the brain whether you are leaning or not and you have to rely on the inner ear and the muscular system. In short, this is why the saying 'Don't look down' actually works in practise.

I can now reveal that there is a very simple solution to this complex problem. If you want to have great balance while standing up on high or moving objects.

Practise, practise, practise...!

Static & Dynamic balance

These are essentially the two separate parts of balance in relation to Taekwon-Do as defined by General Choi in the condensed encyclopedia. You might be forgiven for assuming that static balance is without moving while dynamic balance is with movement. However this is not the case.

Remember though, that Static and Dynamic stability are 'so closely related that maximum force can only be achieved when the static stability is maintained through dynamic stability' (Gen Choi Hong Hi).

Dynamic stability

Dynamic stability refers to where the centre of gravity is in your body at any given time during any given Taekwon-Do move. For example, when in a walking stance, to be dynamically balanced the centre of gravity must be in the middle of the body exactly half way between the legs and vertically aligned which will be approximately around the umbilicus. This stance as we know calls for a 50\50 distribution of weight on each leg.

Remembering the points of where the centre of gravity is at any given moment as discussed in the previous chapter, we can then say that if the centre of gravity in this position (walking stance) is not exactly in the middle of the body between the two legs, then you are not dynamically balanced. Following this logic, you must be leaning slightly one way, either sideways or front and back. If you are punching, you will have to lean very slightly anyway to compensate for the arm that is extended in the punch, however some students bend the front leg slightly or position the hips accordingly, or tense the back, shoulder and stomach muscles rather than shifting their weight distribution. This is preferable to leaning in any direction, but remember we are talking about very small amounts of movement. And this assists in explaining why some young junior students overbalance forward when they first start punching in this stance, as when the punch is executed the arm is moving faster and therefore weighs more as well after coming to an abrupt stop. The amount of movement is more predominant in a bending stance or while executing a kick where both dynamic and static balance must be maintained while you support the body on one leg.

So if you haven't made allowances for this, or your head is tilted to the side, or downwards etc, you will not be able to produce the same degree of power that you would otherwise be able to if you were properly dynamically balanced, and this is what it is all about.

'The power and effectiveness of any Taekwon-Do technique is multiplied by the body's ability to balance correctly.'

In an L stance the rules are the same, except that the weight distribution for the legs has changed to a 70\30 split. In this case the centre of gravity has shifted to a position somewhere over the centre of the rear foot. Again, you will not be dynamically balanced if the centre of gravity is not in this position.

Static stability

Static stability refers to stances and being in the correct position for each technique executed; whether you are executing the technique, in the middle of the technique, or finished the technique. For example, lifting the heel of the supporting leg during a turning kick. This means that if you are in the habit of performing a turning kick to a target and lifting the supporting foot's heel off the ground at the moment of impact, you will greatly reduce the amount of power generated as the heel is the channel for all the major upper body muscles that come into play when the kick is performed, and not the ball of the foot. For more understanding of this, see Doctor Jake Pearson's thesis on the Kinematics and kinetics of the Taekwon-Do turning kick, again available on the ITF NZ website.

Dynamic and static combined

Let's take the walking stance middle front punch scenario again and look at the two different stabilities. The student may look like they are dynamically balanced and the centre of gravity is correctly placed, however if the heel of the rear foot is raised, static stability is not maintained, and dynamic balance will also have been lost as the centre of gravity will shift due to the heel being raised. Quite possibly the front leg will be bent too far, or the student will be leaning, again compromising dynamic stability as well as static. The result is again a loss of power for the technique. This can sometimes happen while performing a side or turning kick, however the rear heel coming off the ground while forming a walking stance, or the student leaning, is a common fault for beginners.

Dynamic stability may very well be maintained in a stance while kicking but again if the heel of the supporting foot is raised, static stability is broken, and the kick will be less powerful.

There are other factors related to power of course, however I am only concerned with balance here. I strongly recommend that you read the section in the General's Encyclopaedia on the Theory of Power. All elements must be brought together for the technique to be powerful, and not just balance.

It is easy to see now how the two areas of static and dynamic balance are so closely related and both must be fully understood. In most cases, one doesn't work without the other.

In the encyclopedia and in a lot of other Martial Arts books, striking while the opponent is off balance is seen as crucial to a successful attack or defence, which is the reason that a good sense of, and ability to balance correctly, are so important.

Balance in patterns

Good balancing in a pattern is essential to performing the pattern. All elements of the theory of power must be brought together during the pattern's performance. Without balance, there will be little power as I have covered in the previous chapter.

All patterns and exercises require movement, whether you are moving from one position to another or one movement to another. Balance must be maintained on each move, but more than that it must be maintained during each move. Remember, an unbalanced opponent is easily defeated as they are unable to strike or block quickly or effectively.

As you progress through the ranks you will at some stage come to a revelation on the movement and position of your body between techniques. This position is called the intermediate position, and it is very important. Your instructor will no doubt have mentioned it to you and also explained its significance, however it is very important to balance in patterns. An unbalanced intermediate position will render its following movement ineffective or severely restricted in power. Also remember not to pause in the intermediate position; it is just the position between the start and finish of the movement.

Let's take the first movement of Saju Jirugi, right side. The start position is Narani junbi sogi or parallel ready stance, and the first move is stepping forward to right walking stance middle front punch, after the first intermediate position of course. In layman's terms, this is simply stepping forward from a parallel ready stance to a walking stance with a punch. There are however three positions that are involved. There is the starting position, the intermediate position, and the finish position. We know the start and the finish position, and we can work out where the centre of gravity and the dynamic and static balance positions are for them. The intermediate position is a little more difficult as the left hand comes forward in front of the body and the right hand moves towards the right hip ready to punch. The right leg is bent and ready to move forward into the walking stance while the body has leaned slightly left to compensate for the weight shift. There is a perceived slight pause in the movement at the intermediate position where the upwards part of the signwave is achieved but for all intents and purposes, the movement from its start to its finish is seamless and increases in speed and power throughout.

This is basically the intermediary position for moving into the walking stance and the punch. What you have to do now is to take a look at where the centre of gravity is for the body. It will have moved from the centre of the 50\50 split in the ready position to a place more towards the left leg as the right leg has been bent and most of the weight is now being supported by the left leg.

So, what does this all mean, because it's getting a little complicated, especially for a beginner?

It means simply that if you don't maintain your balance as you move from the start of the technique to the finish or the execution of the punch, or block, or kick etc, it will lack power and be improperly performed. And this means that you may not have stopped your opponent and protected yourself. In practical self defence terms, all you have managed to do is to make your opponent angrier at you, and possibly placed yourself in greater danger.

So, how do we maintain our balance at all times?
Three words again...Practise, Practise, Practise!

Taekwon-Do & Ballet?

Taekwon-Do and ballet are very similar. Think about it. Both require a lot of practise and dedication. Both demand a high amount of control over the body. But most important, both require a fine degree of balance.

Having instructed a former ballet and dance class student, I was very impressed with her ability to balance in any given position. And for a beginner student to perform a reverse turning kick perfectly after the third attempt was simply amazing. And it was powerful with perfect foot position too.

The obvious connection is of course the great degree of muscular control ballet dancers have developed over their bodies. These guys and girls are superbly flexible and incredibly balanced. Even just walking, they seem to do it better than the rest of us.

With music comes rhythm & movement, and with movement comes balance. It is then easy to see why dancers are especially good at Taekwon-Do, as they have already developed a lot of the skills necessary, all that remains is to understand the fundamentals and apply them with practise. This also works the other way to some degree, however although nearly all ballet dancers can pick up Taekwon-Do and be good at it, not all Taekwon-Do students would be good at ballet!

There was once a famous American Football coach, who forced his team to take ballet lessons. I forget the name of the movie it was in, but the point is that after their initial negative attitude, the team started to develop a greater sense of their bodies movements and position while running, throwing, receiving, tackling etc and to such a degree that through ballet, their own sport and individual performance improved quite considerably. Greater degrees of body control and balance are vital if you are going to succeed at any sport or martial art, no matter what the style might be.

I am not suggesting that you should all go out and join a ballet class, but if you look at some of the exercises at the end of this article, you will see similarity between what a ballet dancer practises, and what we practise to be good at balance.

Emulation

Emulation is something all instructors encounter. If you set yourself up as an example by standing in front of your students and performing patterns, sparring, breaking or just general instructing, then you will be emulated. Instructors are mentors and role models to their students, and inevitably to their friends and the people around them.

While taking pictures to use in this thesis to show balance, my 20 month old grandson decided to get in on the act. He often comes out to the garage when I am practising breaking and it wasn't long before he showed up. In fact he was a big help as his weight, albeit only 13 kilos, helped to stop the chair tipping, and I noticed him attempting a side kick while I was balancing.



With a little bit of help, he was easily able to get his



body in the right position, something he now asks me to do with him often. Of course at his age he has limited control over his balance, and still falls over regularly. But amazingly enough, he can kick a ball, stand on one leg, and loves to kick and punch the practise pad. I wonder how long it will be, if he keeps going, and at what age he will be able to perform a sidekick with control and balance?

Practise, practise, practise...



Notice that while Fletcher is balancing on one leg, he has learnt to shift his weight to the other leg and to raise his arms slightly to use as balance poles in order not to fall over. Brilliant!

Balancing exercises

Well, that's it. All you need to know about how your body balances, why it balances, and why you need to balance better. Now all that remains is to start practising

But before you do start practising your balancing exercises, we need to go over a few things.

First of all, remember to breathe regularly throughout all the exercises. Breathe in through your nose at all times, and attempt to breathe out through the mouth, tensing the stomach muscles at the point where a limb is extended. This will assist with preparation to receive a blow or to give one and also assist with power. Keep your mind focused and concentrate on what your body is doing and what you are trying to get it to do. Remain relaxed at all times; being tense in the muscles that aren't being used is a waste of energy and won't help you balance better either.

Your club is not always the best place to practise, unless you are able to shut out any noise and distractions. Also, training time with your instructor is precious and these exercises can be practised at home. If you can get to training early and do them, then that's great.

I always tell students that if they are watching TV, they can be balancing or stretching just as easily.

The following exercises are not in any order, some you will find easy, others more difficult, and some are quite hard at first. You will begin to see improvement after only a few practise sessions, but remember like with everything else, you must work at it. Everyone is different of course, but I encourage you to keep at it. Most exercises are from what I have been taught over the years, some are my own, and some are from research and I have given credit where I can for these. You can and should make up your own too.

Balancing works hand in hand with stretching. If you physically cannot bend the leg or arm etc into the required position, you need to work on flexibility as well. Both can, and should, be practised together. Again, there is an excellent thesis on stretching on the ITFNZ website in the reference section by Mr McQuillan titled 'Stretching to Perfection'.

Finally, please be careful attempting the exercises that require you to stand on chairs etc.

The leg raiser

This is the basic starting balance exercise for most people. Start by standing with your feet facing straight ahead, a shoulder width apart. Now raise one leg up straight out in front into a front snap kick position and hold for a few seconds and then lower. You will have to lean away from the leg extended and you should also maintain a good guarding block with the arms. Then try the other leg. If this is difficult, then don't extend the leg out into the kick, instead just raise the knee. It is easier to balance with a limb that is raised but not extended.



Now try the same thing only raising the leg to the side. You can vary it by changing the foot and hip positions and seeing how you have to lean and move the upper body to compensate for the changes to the extended limb. As always, do them slowly.



Also try extending to the rear in a back kick, to the front for a twisting, diagonally for a turning kick etc, and so on.

When you think you are getting good at this, try using a chair to stand on, or in this case, a plank laid between two chairs about 40cms above the ground. Notice the main difference between the ground and balance beam shot is that a guarding block is maintained on the ground, but when Josh first tried it on the beam, he had to keep his arms extended to maintain balance, just like Fletcher above.

The rocker

This one looks easy, but it's not!

Start by standing up straight. Raise your body onto the balls of your feet while reaching to the ceiling with your hands. Link your fingers together if you want to. Now see if you can go up onto your toes and still balance.



Slowly bring the arms down and relax the legs. Now rock back onto the heels, lifting as much of the front of the foot off the ground as possible for as long as possible (this is the difficult part).

The handstand



This one is exactly what it looks like, a simple handstand. It builds upper body strength as well as coordination, but it is especially good for balance as we are not used to 'standing' on our hands. It is also useful as being upside down puts a whole new aspect to balance and encourages new pathways in the brain to form. It will also produce a rush of blood to the brain, so afterwards, stand up slowly!

Start by doing a handstand to a wall if you have to, so that the wall catches your legs. Then when you are comfortable and able to support your body on your hands (for most people this means a few days practise), try 'walking' a few steps.

You can also try a one handed handstand if you find this easy and for an ultimate test, use the balance beam!

The unraveller



This one is harder than it sounds. Start by sitting cross legged and cross armed. Now simply stand up!

Don't step one leg forward, just apply leg strength to the side of the feet touching the ground and stand up on the spot, just like a cartoon mechanical extender hand criss-crosses out and grabs an object. You may find yourself twisting or turning around as you rise, and in fact, if done properly this is what will happen. Practise until you can go smoothly up and down again without losing your balance or taking a step. This one is great for strength as well.

The diver

This exercise is sometimes used to test inner ear balance and sinus problems by doctors and most people can do it easily enough.

Start by standing up straight with arms crossed and fingertips on opposite shoulders, not crossed as they are here. Cross one leg in front of the other with both feet flat on the floor. Tilt the head back slightly and close your eyes. It is important to keep the legs tightly crossed. You should be able to stand absolutely still for 1 minute. This one doesn't seem like a balancing exercise on the outside, but it most certainly is. You are not building muscular development, but you are training your brain to 'listen' to your ears better as you cannot use your eyes, and this will help with all the other exercises.



The see saw



This one requires a balance beam and a partner, so you will have to do it at a school gym, or improvise at home with a chair or similar etc.

Place your back against the balance beam while standing and lean back, lifting your legs off the floor being careful not to lean too far back. This is where your partner comes in. The idea is to be perfectly balanced with the beam in the middle of your body running left to right and your arms above your head and legs together. Get your

partner to help you into position so you don't fall over backwards as Josh and James are doing here. You should be perpendicular to the balance beam.

Now open the legs slowly. You will start to fall backwards. As you do, bring your arms towards your sides, which will balance the excess weight lost by moving the legs closer to the balance beam. Have a play with how much you can move each limb and how it affects your balance.

Safety Tip – use a pillow or break-fall mat if the balance beam is hurting your back, and make sure your partner is in a position to stop you from falling over backwards.

The jumper.



Stand on one leg and jump forward landing on the same leg, without over balancing when you land. Your degree of balance and leg strength will define how far you will be able to jump. This is a great strength and balance exercise. This exercise can be varied to jumping in a side kick position forward with the leg extended, or kicking each time etc, or any other kick you want to try.

The fuzz



This exercise is simply walking a straight line, heel to toe, placing one foot directly in front of the other in the same way the police do with drunk drivers on those police video shows. Try it with arms out, arms crossed, arms in, then eyes closed etc. Now try it on a balance beam with your eyes closed, it's not so easy anymore.

The clock

Stand on one leg and tap the other foot on the floor at all positions of the hour hand, while keeping the supporting leg in the same position. Just tap the foot lightly, you don't want to use it to keep your balance.

Tip - Start at 8 or 9 o'clock or you will have to move the tapping leg in front and then behind the supporting leg, although this variation makes the exercise interesting. You can vary it by tapping close or as far away from the body (as in this picture) as you can. This exercise is supposed to help in building new connections in the brain and assisting in coordination as well as balance and does work really well with young children who have trouble with their balance at training. And it is easy enough for them to do first time so they get a great feeling of achievement.



The airplane



Sit on your bottom with your knees pulled into your chest and leaning back slightly. Extend your arms out to the side. Slowly raise one foot off the ground and extend the leg. Feel the balance. Then raise the other foot off the ground and extend the leg. You should be balancing on your bottom.

Then try it again by grabbing your feet and holding your toes while you extend your legs outwards in front, like a low twisting kick. Then try it again but separating the legs outwards as in a high twisting kick. This exercise gets a 'D' for difficult!

The writer



You will need a pen, or some chalk for this exercise. Start by standing up straight. Hold the pen or chalk between your toes and write your name on a piece of paper, or cardboard or something similar. Pretty easy so far. Now write your name farther away from your body. Now it's not so easy. This exercise is great for showing balance with small body movements.

The classic:

This exercise is essentially a combined version of the different exercises in 'The leg raiser' earlier on, just more difficult.

Extend the leg while standing with your feet parallel, and shoulder width apart, into a front snap kick, as high as you can manage. Bend the supporting leg and grip the floor with your toes. Perform this very slowly and with correct technique. Hold the front snap kick position for 5-10 seconds.



Pull the leg back in ensuring you keep the knee raised. It's important not to put the foot on the ground at all during this exercise. Now extend the same leg into a sidekick. You will have to rotate the hips and supporting foot as normal and again use correct technique and perform slowly with the high punch. Hold the position for the same 5-10 seconds.

Next, pull the leg in again and extend it behind you into a back kick, following the previous speed and correct technique etc.

From the back kick, raise the knee, again without placing the foot on the ground and bring the leg forward into a turning kick, same speed, technique, etc.

Finally, rotate the body around in a complete circle by turning the supporting foot and with the leg extended form a reverse turning kick. If this becomes easy, go around 3 times.

If you can do all these kicks slowly and with good technique and correct balance, you are well on your way to balancing to perfection. But just to make it harder, try this exercise on a balance beam up off the ground!

The balance beam.



If you train in a school hall or gym, they will most likely have a balance beam. Most of the previous exercises can be done on the balance beam, and the added height from the floor adds a big difference to your balance, as discussed in the chapter on balancing on objects.



Start off just walking up and down the balance beam. In theory you should be able to do the same exercises ok, but sometimes theories don't work out in practise.

Try the easier exercises first so that you can get used to the height, and if you are teaching anyone, especially children, use a safety person or a safety mat etc. Safety first!

The crouch

Start crouched down balancing on the balls of your feet, with your arms wrapped around the knees. Slowly stand up and then sit down again, staying on the balls of your feet all through the movement. Try this one with arms extended and crossed, and then as usual with eyes closed. Go as slow as you possibly can, which will increase strength in the legs greatly.



The Cossack



This one starts in the same position as 'The Crouch' but there is no standing up. Extend your arms slowly and when you are stable, raise one leg off the ground, so you are balancing on just one foot, on the ball of that foot. Now try and see what kicks you can do! This is one of the most difficult balance and strength exercises here!

The extender



This is a difficult exercise. Stand on one leg and touch the floor as far away from you as you can without falling over. You can lean over any way you like, you can turn on the spot, but you mustn't fall over and must return to standing straight up with putting your foot down only once. Now do it again, only further away. See how far you can get with practise. You can also practise touching objects higher up, like the door handle to your bedroom, the

TV off switch (instead of using the remote), and ultimately the light switches. But kids, beware, if you get told off for putting your unwashed toes on the light switches, I'm not to blame!

The spinner

This is a balancing exercise, although unlike the others it is done while the body is moving at a faster pace and is for practising your reverse turning kick. Start by standing up straight, arms by your side. Then see how fast you can spin on one foot, and how many times you can go around without falling over. Try the other side. When you have mastered this and don't fall over, lift one knee and repeat the exercise until you can spin around 2-3 times with the knee raised as high as you can, again without falling over. Now extend the leg and continue to spin as fast as you can with the foot straight up in the air. Once you have mastered this you are 90% of the way to a good reverse turning kick. The next obvious step is to rotate the hips and turn the foot over to bring the heel into play as the attacking tool.

The Cross/Crawl

Standing, lift one knee and touch it with the opposite hand. Repeat on the other side. Continue this movement back and forth. Gradually raise the hand so that instead of touching the knee it swings up beside your head. Now follow your hand movement with your eyes, back and forth, still raising your knees. You can do this to music, or better still, hum as you do it (humming has a very balancing effect on the brain, I kid you not!).

This great exercise and others like it can be found on the following website and the reason I include it is that these kinds of exercises greatly enhance the bodies' mental and physical agility

<http://elizabethmass.com/bbbe.html>

Brain Gym™, developed by Paul Dennison consists of a number of subtle movements, postures, and exercises to enhance learning ability, improve performance, and become more mentally fit. These energy-based exercises open the pathways between the logical, analytical, detail and time-oriented left hemisphere of the brain, and the creative, intuitive, big-picture, space-oriented right hemisphere.

By balancing the energy flow between these two parts of the brain, we're able to concentrate better, focus attention, read and write more effectively. We improve memory and develop better organizational skills. Through the regular practice of these exercises, we also create a smoother, stronger connection between the brain and body, to strengthen our skills and enhance our ability to perform. (*Paul Dennison*)

Summary

Improving balance will open up a whole new world to Taekwon-Do students. Once they start to improve their balance, it is amazing how much their whole skill level improves, in particular with patterns. We often hear people referred to as either sparrers or patterns students, meaning that they can do one or the other well, but not both. Or perhaps it is that they prefer one to the other.

I can guarantee that if you improve your balance, you will be able to break more boards. You will see a big improvement in your patterns, your sparring and you will gain new insights to your Taekwon-Do training as a whole.

These exercises are great fun to do as well. And instructors, I recommend allocating half or even a whole training session to trying them all to try some different kind of training. Children especially like to see who is best at standing on a balance beam in a side or front snap kick position and while they are having fun, they are learning and practising.

Remember that as with everything, you get out of it what you put into it. While just 5 minutes a day will produce great results, 10 minutes will produce awesome results. If you are watching TV, then you can be practising your balancing and your stretching. And not only that, by balancing and stretching at the same time each day you will build a habit that is easy to keep going, and of great benefit to you.