

Anatomy of the Pelvis – dogs, dolphins and fish!

If you were a dog you would:-

A) Be very happy – as long as you are fed, stroked and walked. Dogs are perhaps the most contented creatures on the planet (a Buddhist guide at the British Museum said that if you did your meditation and led a virtuous life you might, if you were very lucky, get reborn as a dog to a British family – “heaven on earth”, as she put it).

B) Have a tail to wag to show you are happy, or tuck under if you are sad, or – in the case of my sausage dog, Ellie – stand it straight up when other dogs approach, as if to say “Oi! Who goes there?”

Humans, dogs and other mammals share many of the same structural features. If you see a dog’s skeleton, you can identify the ribs, shoulders and hips very easily. It all looks familiar. But unlike dogs and other animals running around on four legs (where that stretched out tail also provides extra balance), we – and to a lesser extent our ape ancestors – have come up to standing. The move from quadruped to biped is the most significant evolutionary shift in our structural history because it completely changes our relationship to gravity – the main force within which all creatures on the planet exist.

We still have a tail, but ours is shortened curled under and has become the key structure from which the pelvic floor has developed. Think about it. While running around on all fours, the weight of the internal organs of the body is supported by the ribs, chest cavity and abdominal wall. Shift yourself upright, and all the pressure is now going downwards to, and through, the pelvis to the pelvic floor. If the pelvic floor was not there, where would our guts and digestive system be? Dragging along on the pavement behind us!

Let’s consider another evolutionary path, this time the one taken by whales and dolphins. Fish swim by swishing their tails from side to side. Dolphins and whales swim with an up and down movement of, their tail bone. They too are mammals, but having chosen a life in the sea, their tail bone developed differently and became long with powerful muscles attached. A dolphin is so strong, that trainers can stand on tip toe, hold out a fish, and the dolphin can “tail-walk” – “stand up” on the surface of the water by rapidly working their tails backwards and forwards (the lazy ones just fly out of the water and grab the fish, but this too is an awesome demonstration of tail bone power).

Unlike a dog, you don’t have a large tail to wag to show your pleasure when you meet a friend (a smile and/or a hug being more usual). However, you can wag your tail, it’s just not visible. Try this exercise to awaken your tailbone and pelvic floor. Visualise your skeletal core – the axial skeleton – terminating at the sacrum and then the coccyx (your tail bone). The muscles of the pelvic floor fan out from

the tail bone (which is why it is easier to squeeze your anus than lift the front of the pelvic floor). Visualise yourself as a dolphin, and rhythmically contract and relax the back of the pelvic floor, feeling as if you are drawing the tail bone in as you contract and letting it move outwards as you relax. You are wagging your tail in and out. Can you reach that fish?

This, and many other wonderfully imaginative visualisations to awaken the pelvic floor are in the Eric Franklin book, *Pelvic Power* (1).

Let's take a moment to consider the anatomy of the pelvis (see diagram 1). The pelvic girdle has three main joints – two sacro-iliac and one pubic symphysis. The public symphysis is a fibrocartilaginous joint, with a thin plate of hyaline (ordinary cartilage) on the surface of each pubic bone and an intervening region of fibro-cartilage. There is slight flexibility here, and the joint becomes softer during pregnancy, even moving enough to cause significant pain in some women – “pubic symphysis dysfunction”.

There are also the joints between the girdle and other bones – joining the 5th lumbar vertebrae and the top of the sacrum, and between the lower part of the sacrum and the coccyx. This last joint allows the tailbone to move somewhat, changing the tension of the muscles in the pelvic floor.

The rings of muscles that make up the main structure of the pelvic floor are also shown in diagram 1, and are known as the levator ani – Latin for anus lifter! Diagram 2 is stylised to show the fan-like pattern of the musculature of the pelvic floor.

This arrangement of bones and muscles is cleverly designed to give the pelvic floor two conflicting purposes – to be both strong and flexible. Strength is needed to support posture, the internal organs and be weight-bearing, but flexibility is vital because every day the pelvic floor has to allow the passage of urine and faeces. The biggest test of all for the pelvic floor is childbirth, where an incredible ripening and stretching process occurs to allow the baby's head to pass through the vaginal opening, with the help of the bones of the pelvis widening at the base by accessing maximum movement in the sacro-iliac and pubic symphysis joints.

Incidentally, Eric Franklin points out that even after 9 months in the womb a human baby is born helpless and dependent, whereas other mammals, like deer, are up and running within minutes or hours. The reason, of course, is that we have huge brains, which go on growing after birth, whereas other mammals have their brains nearly fully grown and developed at birth (and they don't want to lie around to be eaten by a predator!). If humans were to be born with brain development equivalent to most other mammals, they would have to stay in the womb for 21 months, not 9 months. That would mean women would need much bigger hips to allow a bigger baby to be born – probably not a good idea as most women I know already think their bottoms are too large!

As a man, it is difficult to appreciate the miracle of the pelvic floor stretch during birth, although if you have ever struggled to pull your head through a tight roll-neck pullover, you may have some idea of forces involved and the elasticity required!

In yoga there are many excellent practices to bring awareness to the pelvic floor and strengthen it. These include ashwini mudra (meaning “horse gesture”, ie tensing and relaxing the anus like a horse evacuating its bowels), and moola bandha (the more subtle and sustainable practice of lifting the perineum). These strengthening movements are particularly helpful for women who have given birth and because the female pelvis, and therefore also the fan of pelvic floor muscles, is broader than in men. For male students the pelvic floor is narrower and not bisected by a vagina and so is structurally stronger.

There is a challenge in working the pelvic floor as we are limited mainly to isometric stretching, because there are no highly mobile joints to move isotonicly. However, we have already seen how we can wag our tail. Another helpful exercise is to feel the small movements of the sacro-iliac joints. With one hand on each sit bone, move carefully in and out of Prasarita Padottanasana (wide-legged standing forward bend), bending the knees a little to keep the lower back happy. Feel how the sit bones are drawn apart as you fold forward and come back towards each other as you come back up. You can also feel the opposite movement by placing the hands either side of the top of the hips (the iliac crest). This time, the top of the hips will move inwards as you go into the forward bend, and outwards as you come up.

For the sake of core stability, the sacro-iliac joints allow only subtle movements. The bones of the sacrum and ilium are tongued and grooved and fit snugly into each other. Although this is a proper synovial joint, with lubricated surfaces, its architecture and strong ligaments mean that the movements are small, and certainly decrease with age, especially in those who don't exercise.

Although subtle, these movements are like master commands from the body's movement control centre. Subtle shifts in the sacro-iliac joint on either or both sides of the pelvis change the relationship between the hips and the legs and pelvis and the lower back.

The main dividend for an awakened pelvic floor – that is both strong and flexible – is improved posture. The lift in the perineum also triggers an engagement of the lower abdominal muscle (transverse abdominis) and multifidus – a group of deep back postural muscles. These three muscles are linked by the nervous system, making them the three musketeers of good posture because it is a case of “all for one and one for all”.

So the lift of the pelvic floor engages the main core muscles, giving the student core stability. This translates to a slight tucking under of the tailbone (remember that the pelvic floor muscles have one of their attachments at the tailbone, so engaging them will draw the coccyx inwards), which leads to a lengthening of the lumbar spine as the top of the pelvis moves backwards (a pelvic tuck). The spine is therefore held straighter and is better supported from within, creating a firm foundation from which to stretch and move into any asana.

This engagement of core from the pelvic floor tones and flattens the tummy. There are knickers on the market that do the same thing (as worn by Renee Zellweger in Bridget Jones's Diary), but it was pleasing to read in the newspapers recently ("How tummy tuck Knickers could harm your health") that this external support is no substitute for the real thing. Breathing problems, heartburn and stomach ulcers could all result from wearing the big knickers, scientists say. No artificial corset is a good substitute for our natural muscular one – a good job that we can recommend yoga as a safe alternative!

It is beyond the scope of this article to explore in depth the lines of movement in the pelvic floor muscle matrix. However, diagram 3 gives an indication of the way the layers of muscles form swirling patterns of movement around the gateways in and out of the body (anus, urethra and vagina/penis). Of course this area is also important energetically, being the base of the energy system at mooladhara chakra and the dwelling of kundalini shakti. It is interesting to note how the loops of muscle movement resemble the four petals of the mooladhara lotus.

There is a dynamic interrelationship between the pelvic floor and other nearby muscles, including piriformis and iliopsoas in the hips and lumbar area. The pelvic floor also works in harmony with the diaphragm to manage pressure and tension in the abdomen. As we breathe in, the diaphragm moves downwards, pushing the tummy out and pelvic floor slightly downwards. Both move up together on the exhale. This is one example of how the body is constructed with a series of floors and ceilings, with body organs resting on floors and/or being suspended from ceilings by ligaments. One of the advantages of good upright posture is to stop your floors from bowing and to keep the space between your floors and ceilings.

It is also worth reminding ourselves that few movements in the body happen in isolation. As Tom Myers sets out in his Anatomy Trains book (2), lines of movement involving muscles and connective tissue can be plotted all over the body at superficial and deep levels.

So let's finish with one such anatomy train, the rectus series which runs from the pelvis to the chin. It starts at the pelvic floor (coccyx to pubic bone), continues with rectus abdominus (pubic bone to breastbone), then sternohyoideus (breast bone to hyoid bone in the neck) and finally geniohyoideus (hyoid bone to jaw).

Millions of years ago, in the first fish to evolve, this was all one muscle. In humans it is divided by bony junctions, but the muscle chain remains intact. If you contract your rectus abdominus (six pack), you feel the tail bone being pulled forward. In the same way, you can tighten the pelvic floor and feel the rectus abdominus engaging.

A backbend, like cobra, stretches the whole of this muscles chain. It also means that tension at the top of the chain in the jaw can lead to tension at the bottom of the chain in the pelvic floor and vice versa.

So explore and play with your pelvic floor. Be a dog, a dolphin or a fish. Use your imagination. And there's no need to be over technical with your students. If eyes seem to be glazing over, just boil it all down to a tabloid-like headline: "Squeeze your Bum to Flatten Your Tum". That is one instruction they always seem to understand.

1. Pelvic Power by Eric Franklin (Elysian Editions)
2. Anatomy Trains by Tom Myers (Churchill Livingstone)

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Diagram 1 – Muscles and bones of the pelvic floor (from Franklin)

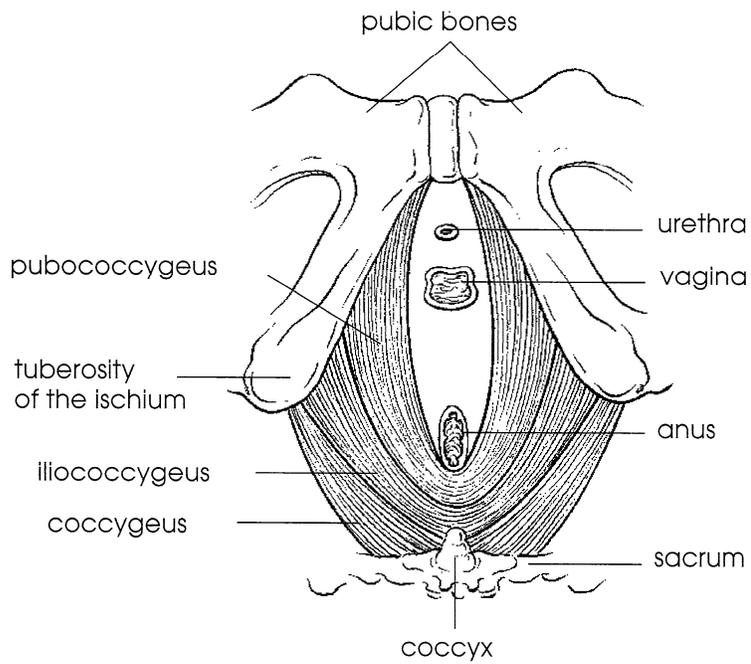


Diagram 2 – The pelvic floor muscle fan (from Franklin)

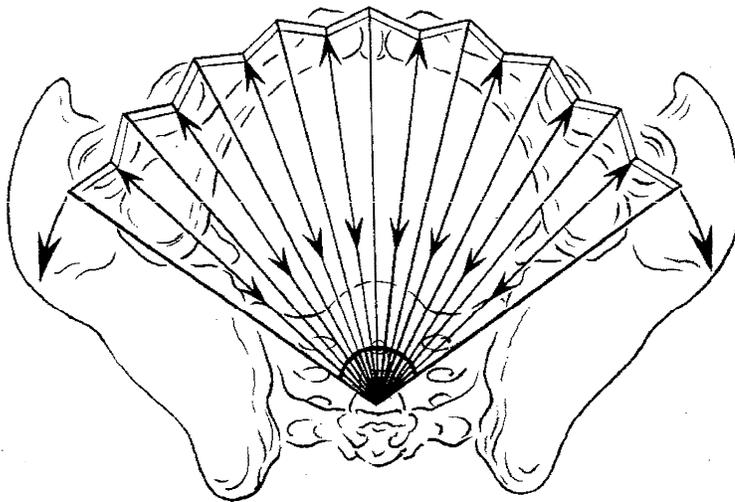


Diagram 3 – Lines of movement in the pelvic floor (from Franklin)

