



# A Guide to Neutral Pelvis, Core Support, and Trunk Stabilization:

## A Resource for Dancers and Dance Educators

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### Introduction

In dance education and training, the concepts of neutral pelvis, core support (sometimes called core stabilization), and trunk stabilization have become an increasing area of focus. Balance, enhanced technique, injury prevention, and sound partnering work are all influenced by these ideas. However, dancers and dance educators might find themselves confusing one for the other, and not clearly understanding how to train the muscles responsible for neutral pelvis, core support, and trunk stabilization, and how to recruit them effectively while dancing. The focus of this paper is to define each concept, describe the muscles that are active, and give some examples of exercises for training purposes. It is not intended as an in-depth discussion of these topics, which can be found in the recommended readings at the end, but rather an overview of how these three concepts differ and overlap, and some suggestions for training.

### Neutral Pelvis

**Definition:** ASIS (Anterior Superior Iliac Spines) and symphysis pubis (commonly known as the pubic bones) are vertically aligned when viewed from the side, front, or above. The most common view is the side, and this alignment of the ASIS bones over the symphysis pubis affects the interaction between the tilt of the pelvis and the curve of the lumbar spine. (Definition from Clippinger 2016, p. 129) The front view of the pelvis can be seen in Figure 1a, and the lateral view of the pelvis can be seen in Figure 1b.

Figure 1a

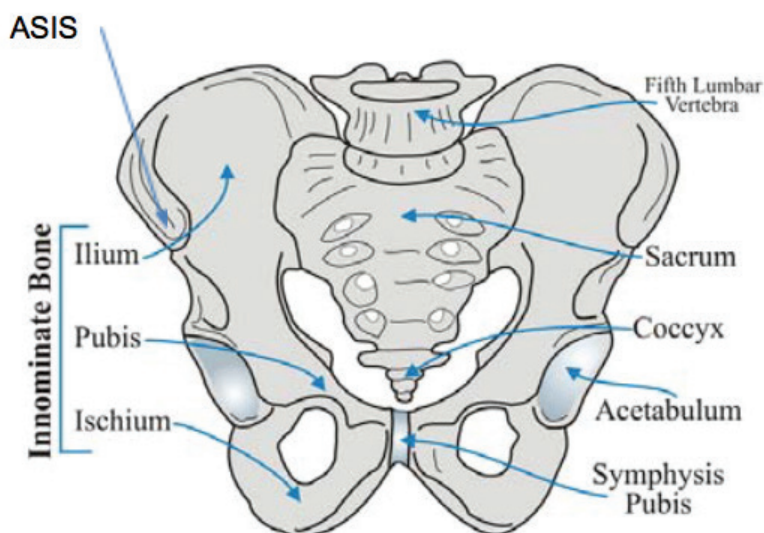
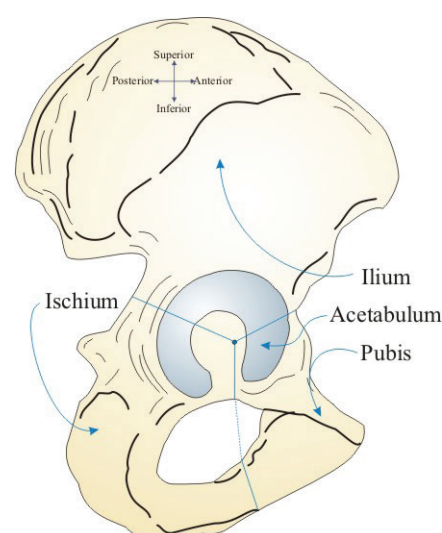
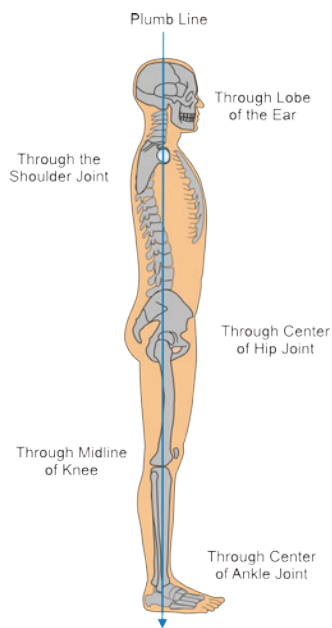


Figure 1b



**Figure 2**



When a dancer is standing, neutral pelvis is a component of neutral alignment, defined in the coronal or frontal plane by the imaginary plumb line that passes through or near the following bony landmarks: the lobe of the ear, middle of the tip of the shoulder, middle of the thorax, the greater trochanter, the midline of the knee, and through the center of the ankle joint. The image of the plumb line can be seen in Figure 2. From the front and back of the body, neutral alignment would include the idea of left and right symmetry.

In brief, the muscles that contribute to neutral pelvis are as follows: the lower rectus abdominus and the obliques, which will move the rim of the pubic bone in an anterior (towards the front of the body) and upward direction, and the hamstrings, which extend the hip joint, or in

other words, will bring the ischial tuberosities towards the femurs. It is also important that the hip flexors (mainly rectus femoris and iliopsoas) and lumbar extensors (erector spinae and multifidi) have sufficient flexibility to allow for this position of the pelvis.

Once neutral spine is established, exercises that can assist in developing the appropriate muscles would strengthen the abdominals mentioned above, as well as the hamstrings, and stretch the hip flexors and lumbar extensors. Eliminating tightness in muscles is as important as strengthening them. For the lower abdominals, dancers can lie on their backs on the floor and do pelvic tilts. Figure 3a shows the dancer lying in neutral pelvis, and Figure 3b shows the dancer in pelvic tilt.

### IMAGE

*When a dancer is standing, if there were a light shining out the bottom of a diamond defined by the pubic bone, coccyx (tailbone), and ischial tuberosities (sitz bones), the light would shine directly onto the feet, not forward towards the front of the room, nor backwards towards the back of the room.*

### IMAGE

*To activate the anterior muscles, see a giant ice cream scooper that starts at the pubic bone and scoops out a big ball of ice cream as it moves up the body towards the navel. To release tension from the hip flexors and lumbar extensors, image these areas as soft taffy melting and elongating.*

**Figure 3a**



**Figure 3b**



Another beneficial exercise is the bridge. Place the feet on the floor with the legs at a point between 45 degrees and 90 degrees (depending on the level of strength and control of the dancer), and hold a physioball between the ankles, press with the feet to lift the pelvis vertically away from the floor. The sequential actions of rolling up and rolling down are very important. Figure 4 shows the dancer in a bridge pose.

For the hamstrings, any movements of the legs to the back, whether standing or lying, can increase strength in these muscles, and weights or exercise bands can be added. Figure 5 shows a version of this exercise, and the image below Figure 5 can assist in executing this exercise correctly.

Hip flexor stretching can be done in the deep lunge position, maintaining neutral spine, and lumbar extensor stretching can be done by curling forward sitting on the floor or in a chair for less flexible dancers. When the pelvis and lumbar spine are in neutral, the agonist and antagonistic muscles that cross the joints of the lumbar spine and hips will be in an optimal position to control and produce movement at these joints.

In addition, the dancer can use imagery to recruit the appropriate muscles in stance and movement. For example, the dancer can imagine the pelvis as a bowl full of water, and the goal is not to spill any of the water out of the front or back. There are dozens of useful images like the ones mentioned here from the book by Krasnow and Deveau (see references). The works of Franklin and Sweigard referenced below are also useful sources.

## Core support

**Definition:** Development of muscular strength and neuromuscular control to protect the spine from injury and help the dancer achieve the demands placed on them in dance (Definition from Clippinger 2016, p. 94.) In most instances, strength of the core muscles is not so great an issue as awareness and neuromuscular recruitment.

It is a myth that if the core support muscles are engaged, it will bring the pelvis to neutral. In fact, the beauty of the core support musculature is that it can engage regardless of the positioning and movements of the pelvis. If this were not the case, dancers would be vulnerable to injury any time the pelvis was not in neutral, such as arabesque, grand jeté, jazz and African dance isolations, Graham contractions, and so on. Core support refers to a group of very deep

Figure 4



Figure 5



### IMAGE

*Begin by lying face down. Imagine that the ASIS at the front of the pelvis are glued to the floor and cannot lift off the ground, and the plane formed by the two ASIS and pubic bone lies parallel to the floor. Lift one leg at a time, alternating. Imagine that the leg gets longer and longer with each lift, and that there is an increase in the space inside the hip socket, so that the leg is literally moving away from the pelvis. The front of the hip is taffy, and stretches out to allow the lift of the leg.*

muscles that lie in the lumbar area and pelvis and engage to protect the lumbar spine from injury. This action is sometimes referred to as core stabilization, but this term seems to suggest to dancers that there is a static or rigid approach involved. This is not the case. Core support can be ongoing during all dance activity.

The muscles of core support are the transversus abdominus (the deepest of the abdominal muscles), the lumbar multifidi (the deepest of the back muscles), the pelvic floor at the bottom of the pelvis, and the diaphragm at the bottom of the ribcage. The transversus abdominus lies on the sides of the body, with fascial connections to the front and back of the body, which is why it narrows the waist and elevates the ribcage when recruited. Recruiting these muscles in isolation is difficult, mainly because any exercise involving movement will automatically engage additional muscles. For example, while doing supine abdominal curls, (rolling head and shoulders up from the floor) the superficial abdominals (e.g. rectus abdominus) are responsible for the movement, but the dancer can think about "hollowing" and "narrowing" the waist while doing the curls. This imagery may assist in recruiting the transversus abdominus. Dancers do not need to think about exercising the diaphragm, but it is essential that they remember to keep breathing while exercising and dancing. Breathing creates abdominal pressure, which helps support the movement of the spine. Further, if the breath is held, the diaphragm is inactive, making it much more difficult to activate the other core muscles. For additional information on exercises for core support, the books and articles by Hides et al., Richardson et al., and Van et al. are excellent sources.

## Trunk Stabilization

**Definition:** Trunk stabilization involves the large, superficial muscles of the trunk engaging to effectively create a solid cylinder of the spine during weight loading. Trunk stabilization is a very different concept from core support. These muscles do this action automatically whenever the body takes on extra weight, such as lifting a suitcase or another dancer. In cases where the muscles fail to stabilize the spine in this manner, it is because they are too weak or there is some pathology, which can result in injury. In addition, trunk stabilization is necessary for effective movement of the arms and upper spine.

The main muscles of trunk stabilization are the rectus abdominus and the obliques, the erector spinae in the back, and the quadratus lumborum on the sides. The exercises for these muscles include variations of plank, side plank (sometimes called side bridge), and the "bird-dog" (on hands and knees with one arm forward and the opposite leg back).

The dancer cannot engage in a single exercise that activates all of the abdominal muscles, so it is necessary to participate in a variety of exercises for training or injury prevention. One word of caution: as with any strength training program, the dancer should start simply and increase levels of intensity and complexity over time. Good sources for trunk stabilization exercises include the work of McGill, McGill et al., and Mori.

### IMAGES

*For plank, imagine a line of energy going out the top of the head and out the heels in opposite directions, and the waist narrowing and hollowing. For side plank, this same image can be used, but also add the idea that the two sides of the body remain equally elongated.*





## Conclusion

It is important that dancers and dance educators consider all three of these concepts – neutral pelvis, core support, and trunk stabilization – when designing a program for conditioning and injury prevention. Each of these ideas contributes a different aspect to the health of the dancer and optimal technique. Once these three concepts are clearly understood, dancers and dance educators can design conditioning programs that target specific weaknesses and needs. In this way, dancers can look forward to pain-free and longer careers.

## Recommended Readings:

Clippinger, K. (2016). The spine. In *Dance anatomy and kinesiology* (2nd edition, pp. 57-106) Champaign, IL: Human Kinetics.

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Van, K., Hides, J. A., & Richardson, C. A. (2006). The use of real-time ultrasound imaging for biofeedback of lumbar multifidus muscle contraction in healthy subjects. *Journal of Orthopaedic & Sports Physical Therapy*, 36 (12), 920-925. doi: 10.2519/jospt.2006.2304

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Krasnow and Wilmerding are also the co-authors of *Motor Control and Learning for Dance: Principles and Practices for Performers and Teachers*, and co-editors of *Dancer Wellness*, both published by Human Kinetics and available on the HealthyDancer Canada website.

## Image Credits

### Figure 1a

Front view of the pelvis

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### Figure 1b

Lateral view of the pelvis

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### Figure 2

The plumb line

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### Figure 3a

Neutral pelvis

Photo by Gary Ray Rush, dancer: Ellis Martin-Wylie

### Figure 3b

Pelvic tilt

Photo by Gary Ray Rush, dancer: Ellis Martin-Wylie

### Figure 4

The bridge

Photo by Gary Ray Rush, dancer: Jordana Deveau

### Figure 5

Single leg lifts prone

Photo by Gary Ray Rush, dancer: Natasha Poon Woo

Photos for **Figures 3a, 3b, 4, and 5** are from the book *Conditioning with Imagery for Dancers*, and are reproduced courtesy of Thompson Educational Publishing, Inc., [www.thompsonbooks.com](http://www.thompsonbooks.com)

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