
Dynamic Alignment, Performance Enhancement and the Demi-Plié

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A primary goal of dance science is to produce healthier and better dancers. It's a win-win situation for dancers when improved technique allows for greater freedom of expression. While studies and experience have shown that incorrectly performed dance movements increase the risk of overuse injuries^{1,2} we often forget how some of the most basic movements in dance need optimal attention and care. The demi-plié, with its fundamental role in many dance steps, is one such movement (Fig. 1). A study by Couillandre, Portero and Lewton-Brain³ with dancers from the Ballets de Monte-Carlo has given us insights to improve the function of the demi-plié and reduce stress on the foot, ankle and spine when performing this movement. By applying a correction using principles of anatomy, biomechanics and movement intention we can influence jumps, turns, and probably any steps requiring explosive takeoffs from a demi-plié. It is a simple yet effective way of improving not only the foot in the demi-plié but also full dynamic alignment (the body's placement during movement). This is of special interest in creating the illusion of *ballon*, an essential element of ballet where the dancer appears to float in the air.⁴

Placement or alignment in static positions (attitude, passé, etc.) is a first step in creating the body awareness nec-



Figure 1 The demi-plié.

essary for *ballon*, but achieving optimal alignment for *ballon* during movement preceding jumps (dynamic alignment) is much more difficult. One of the clearest examples of this is going from demi-plié to jumping. A frequent error is a “bucking” motion of the torso when taking off, as a result of which the dancer only achieves dynamic alignment on the way down. This leaves little time for the audience to appreciate the position in the air. Some teachers consider this error to be due to a lack of abdominal muscle strength, but our study investigated a simple three-minute correction that dealt only with movement intention, not strength. The decisive factor seemed to be one of coordination. The illusion of *ballon* results from coordinated movement rather than jump height. By giving dancers an alternative movement intention in the demi-plié we were able to show that bucking could easily be corrected.

The correction appeared to create a constant muscle chain interconnecting the legs and torso and improving the foot's biomechanics by aligning the heel bone in the demi-plié. The firing of the hamstring muscles going down into plié and then from plié to the jump demonstrated a direct link to the diminished bucking motion in the torso. Researchers have already found that improving technique through muscle coordination is normally associated with the reduction of injury rates,⁵ leading us to consider if the correction could have an influence on injury prevention as well as performance enhancement.

The Correction The Foot

The supporting weight of the foot is ideally divided equally into three points of contact with the floor, the first and fifth toes and the heel bone (Fig. 2). This position helps prevent, among other things, pronation (rolling over) and lifted heels. However, what can make it a notably better correction, affecting not only the foot but also the whole body, is appreciating the body's inherent anatomical structures inside the heel bone, known as trabeculae (Fig. 4). We can see in the images the direction of these internal structures

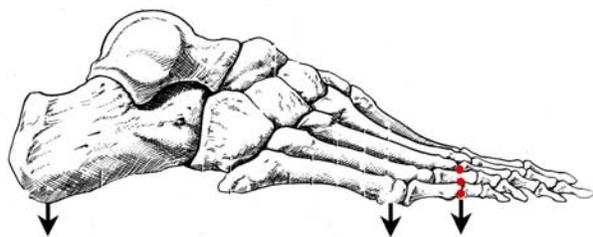


Figure 2 Three points of pressure in the foot.

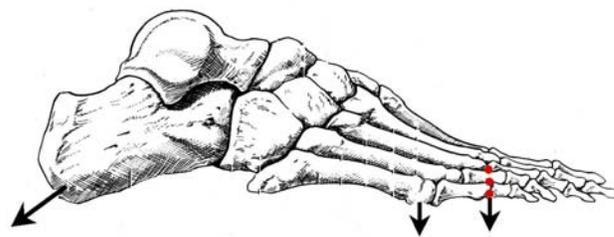


Figure 3 Adapted direction of force.

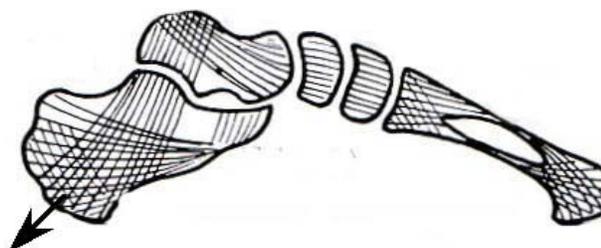


Figure 4 The trabeculae lines of force inherent in the heel bone.

within the bone. What we propose is sending the force of the plié into the foot via the three points on the floor, but the posterior point is sent into the heel (down and back) at a 30 degree angle (Fig. 3). By setting up biomechanical efficiency in the bones of the foot, long muscle chains can be engaged and interconnected to facilitate improved dynamic alignment throughout a movement.

The Leg

Before initiating the actual bend (plié) of the knees, the force being sent through the back of the heel has to be such that the hamstring muscles moderately engage (Fig. 5). Once engaged, the plié movement can follow its course while keeping the direction of the force going back and down out of the heel. It is recommended to practice this initially with students standing in sixth position, so they can understand the lower and backward movement; also,



Figure 5 Indicating the direction of force in first position.

they can place their own hands on the uppermost attachment of the hamstring muscles to feel if they are engaging. When this is understood, change to first position, and now send the force in opposing directions while keeping the hamstrings firing moderately (Fig. 6).

What Happens?

By sending the weight of the body into the foot, directed back and down at a 30 degree angle, the heel bone spirals into an optimal position, pulling the foot much like a suspension bridge, protecting the plantar vault. This also helps the foot keep its rebound quality in jumps. At the same time as the heel bone spirals, the hamstring muscles engage and stabilize the pelvis via their attachments on the sit bones. The pelvis, now anchored, subsequently stabilizes the whole spine. This interconnecting of the torso and legs eliminates the bucking motion in jumping, turns, échappés, etc. (Fig. 7).

Tips

Think of practicing just 1/4 of a plié. It will feel less deep than usual, as respect for the plantar vault maintains more pull on the calf muscles.

Think of the heel bone acting like a ship leaving the port, slowly pulling back before starting the plié. This mental imagery can produce a slow, powerful, yet microscopic sensation of movement.

Conclusion

This correction, developed from several years of refinement in the dance studio and lab tests with human movement scientists, offers a solution to the long-standing problems of “bucking” and collapsed arches. We have underlined the importance of movement intention and biomechanical precision needed in the demi-plié at the barre before

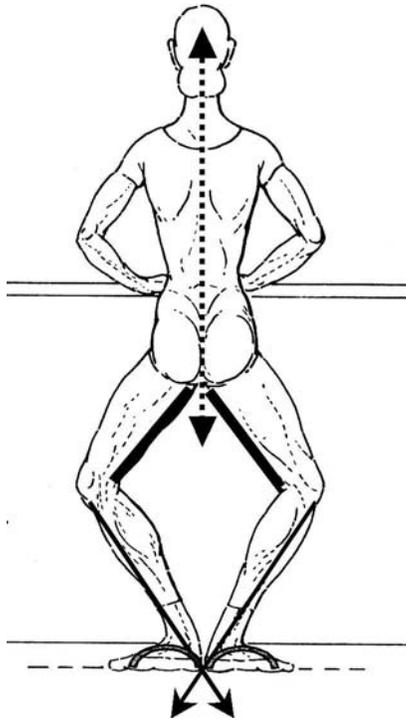


Figure 6 The lines of force follow in the correction.

developing technical brilliance in the center or on stage. The ability to create the appearance of *ballon* or arrive in *passé* or *échappé* in time with the music depends upon mastering the preparatory movements before the actual steps. Even if it is only a reinforcement of your own instinctive knowledge, this groundwork on preparatory movement may help you go further in developing your own expertise.

Acknowledgment

This paper is adapted from: Couillandre A, Lewton-Brain P; Portero P. Exploring the effects of kinesiological awareness and mental imagery on movement intention in performance of demi-plié. *J Dance Med Sci.* 2008;12(3):91-8.



Figure 7 A dancer jumping following the correction during our research with the measuring equipment attached to her legs and spine.

References

1. Teitz CC. Diagnosing and managing common dance injuries. *J Musculoskel Med.* 1996;13(6):46-57.
2. Macintyre J, Joy E. Foot and ankle injuries in dance. *Clin Sports Med.* 2000;19(2):351-68.
3. Couillandre A, Lewton-Brain P, Portero P. Exploring the effects of kinesiological awareness and mental imagery on movement intention in performance of demi-plié. *J Dance Med Sci.* 2008;12(3):91-8.
4. Vaganova A (translated, Chujoy A.). *Basic Principles of Classical Ballet.* New York: Dover Publications, Inc., 1969, p. 69.
5. Koutedakis Y, Frischknecht R, Murthy M. Knee flexion to extension peak torque ratios and low-back injuries in highly active individuals. *Int J Sports Med.* 1997;18(4):290-5.