FOR TEACHERS

Dynamic Alignment, Performance Enhancement and the Demi-Plié

By Peter Lewton-Brain

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-Brain[3] 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

Figure 1. The demi-plié

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

Placement of alignment in static positions (attitude, passé, etc.) is a first step in creating the body awareness necessary for ballon, but achieving optimal alignment for ballon during movement preceding jumps (dynamic alignment) is much more difficult. One

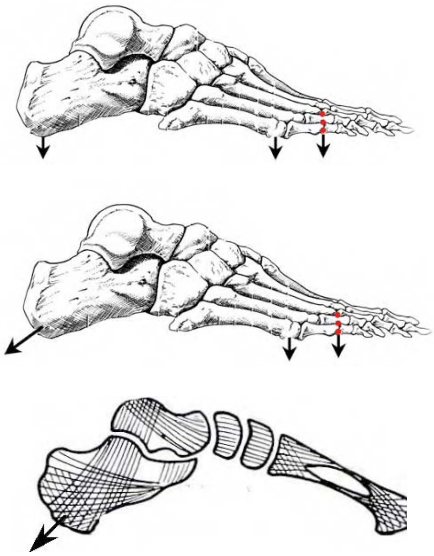

Fig. 2 Three points of pressure in the foot.
Fig. 3: Adapted direction of force
Fig. 4: The trabeculae lines of force inherent in the heel bone.

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

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, leading us to consider if the correction could have an influence on injury prevention as well as performance enhancement.

The Correction of 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 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, 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).

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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 demi-plie at the barre before developing technical brilliance in the center or on stage. The ability to create the

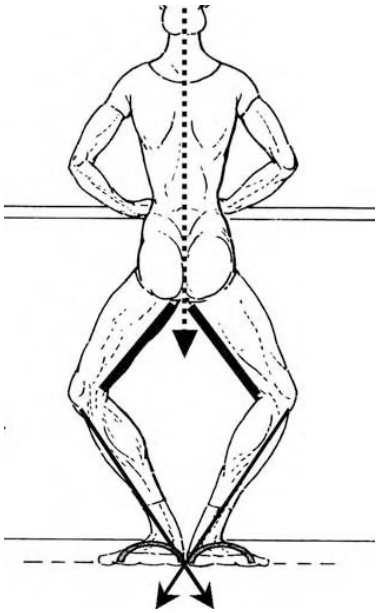


Fig. 6. The lines of force follow in the correction.

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.

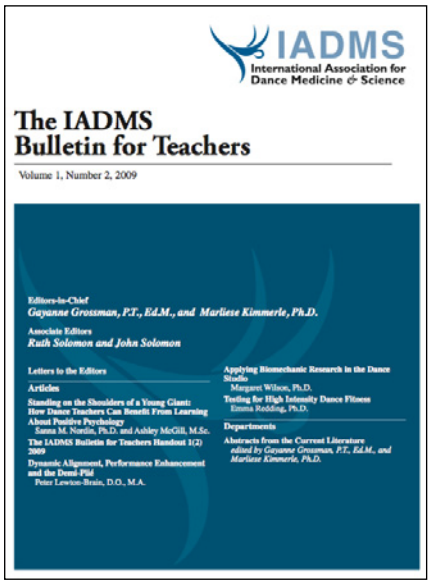
Acknowledgment

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

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. 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.

Fig. 7. A dancer jumping following the correction during our research with the measurig equipmen t attached to her legs and spine.



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The IADMS Bulletin for Teachers applies dance medicine/science theory and research to practical problems in dance education, dance training and dance performance. It addresses issues of concern to teachers of amateur, pre-professional or professional dancers across the age span. The articles identify practical teaching problems and present scientific knowledge that may enlighten teaching practices. Although a number of journals for dance teachers exist, this one serves a particular need: to provide access to the wealth of medical and science research that has blossomed in the last ten years. Many researchers in motor learning, control and development, biomechanics, exercise physiology, sport psychology, anatomy, kinesiology, and medicine have found dance a challenging study topic. Their research, however, is typically published and presented in the journals and conferences of their own disciplines, and does not necessarily reach the practical world of the dance educator. The authors for the Bulletin have been asked to fill that gap. Additionally, a selection of current research is reviewed in each issue. They encourage dialogue with the teaching profession via a "Letters to the Editor" column. Practical problems sent in by dance educators are answered by the IADMS Education Committee. Check it out at www.iadms.org in Publications section.