International Symposium on Performance Science
ISBN 978-94-90306-02-1

Dance pedagogy: Myth versus reality

M. Virginia Wilmerding[1] and Donna Krasnow[2]

[1] Department of Theatre and Dance, University of New Mexico, USA
[2] Department of Dance, York University, Canada

The teaching of ballet is steeped in tradition. As a dancer retires from the stage, he or she will often embark upon a teaching career in order to provide a continuation of that tradition for the next generation. It is not uncommon for the institutional tenets of training dance skills to be at odds with what is biomechanically sound and, therefore, unsafe for the dancer to repeat in daily technique class. Dance science had its beginnings in the late 1960s. Colleges and universities began to turn a serious eye to the analysis of the physical component of dancing. Rudimentary equipment, such as videography, has given way to very sophisticated movement analysis systems such as 7-camera motion capture systems. As the ability to "see" dance increases with more refined tools, teachers of dance in general and ballet in particular need to make anatomically sound corrections and unassailable decisions in the training of young dancers, as the technique class should be the first stop in injury prevention. This presentation touches on just a few of the discrepancies between what is taught and what is actually possible to achieve in the ballet class.

Keywords: ballet; pedagogy; biomechanics; injury prevention

The technique of ballet, as codified and practiced in a class or studio, was developed at a time when biomechanical and kinesiological principles of movement were poorly understood. Misconceptions then became part of the ritual of dance class and dance training, passing from generation to generation. An important concern here is that such misinformation may lead to injury and decreased aesthetic performance. In recent years, advances in biomechanical analyses have allowed dance researchers to "see" what is occurring during skill execution. In many cases, the instructions given during a dance class do not match biomechanical reality.

It must be pointed out that as this field of dance science grows, the lessons of good research are integrated quite slowly. Jo Anna Kneeland first wrote a series of articles in 1966 on ballet technique with an anatomical perspective for *Dance Magazine* (Kneeland and Joel 1966, Kneeland 1966a, 1966b, 1966c). However, it was more than a decade before actual research actively began looking at the difference between what the dancer is asked to do and what is actually possible to accomplish.

This review, derived from recent work by Krasnow and colleagues (2011b), is intended to give an overview of research in the field of dance biomechanics, with visual demonstrations of how divergent class teaching and actual execution of dance steps can be. Plainly stated, biomechanical efficiency of skill execution often contradicts common teaching instructions. The purpose of this lecture is to gain a greater understanding of how careful a teacher of dance needs to be when clarifying what is "correct" in the acquisition of good dance technique.

MAIN CONTRIBUTION

Dance teachers teach what they were taught. Traditionally, the dance teacher uses the same language, images, technical corrections and approach that they experienced as a student. Books on pedagogy are few. Joan Lawson's (1975) *Teaching Young Dancers,* for example, has long been held as the quintessential handbook on how to consider this strictly codified dance form. It was one of the first ballet books to provide basic anatomy to the reader. However, it clearly presents an incomplete picture of the realities of human movement. There have been nearly a hundred studies on biomechanical assessment in dance in the last 50 years, beginning with quite rudimentary forms of assessment (photographs, single camera videography, pencil and paper assessment of joint angles, and plumb-lines and yardsticks to assess alignment and distance, respectively). This paper and lecture covers just three components of ballet: alignment, the use of the barre in ballet class, and the advanced skills of jumping.

Alignment

All dance technique presumes that the dancer is capable of maintaining good alignment. Alignment is understood to be the cornerstone of injury prevention, as well as aesthetic propriety. This concept assumes that the performer can stand and travel while perfectly upright and balanced with regards to distribution of mass in three planes. It is standard teaching practice to exhort the student ballet dancer to maintain the same upright alignment, no matter

the condition (barre, center, traveling). However, in early research, Woodhull-McNeal *et al.* (1990) used photographs to clarify that first position and other positions (3rd, 4th, 5th) had glaring postural differences, standardized to the position, but differing significantly from each other. The point to be made is that alignment is not a stable concept, but is variable depending on one's starting position and one's intent. They also suggested that alignment is variable by condition in individual participants.

Krasnow *et al.* (1997) took the next step, as it were, stating that it is essential to study alignment in dynamic rather than static conditions. They were looking at the effect of imagery on dancers and noted that giving dancers an accurate anatomical image can help assure re-establishment of correct alignment following off-balance movement. Their point was that alignment is a fluid entity and can change depending on the circumstances.

Wilmerding *et al.* (2003) looked at the alignment of children studying flamenco dance, understanding that the heeled shoe is known to alter the postural alignment in adults posteriorly. Statistical analysis evidenced an even division with regards to strategies. Half of the children shifted to greater anterior pelvic tilt and half shifted to greater posterior pelvic tilt when compared with a barefooted stance. As children are known to have poor core strength, care and planning for development of trunk strength in young dancers becomes the take-home message of this research, as again, alignment is important in injury prevention.

Barre

An essential aspect of the warm-up period of a ballet class is the barre, a horizontal bar on which one hand is placed while holding positions and performing movements. Barre use is aimed at providing support to the dancer. The skills required of ballet are first executed at the barre, broken down into small, accessible, and repeatable movements. The dancer is provided in effect with a "partner" by placing one or both hands on the barre. After the skills are practiced at the barre, the dancer proceeds to centre and repeats these skills in increasingly complex fashions without weight support. There is a presumed positive transfer of training when moving the dancer from the barre to center. The exercises practiced with weight support during warm-up are meant to facilitate the execution of the same movements without physical support. However, Cordo and Nashner (1982) found that when leaning on a bar, the postural reflexes did not respond as the subject performed arm gestures that disturbed balance.

The transfer of training from barre to center is undocumented. It is unknown if the muscular and biomechanical movements at barre are similar enough to be appropriately assigned as positive transfer or dissimilar enough to cause a negative transfer. If the latter is the case, the warm-up at barre may be eroding, or at least interfering with, dancing ability.

In a theoretical article, Laws (1985) examined the use of the barre in dance training. Some of Laws's observations include the following: (1) at the barre, more forward shift of torso is possible in performing arabesque than may be possible in center work; (2) the barre allows for stabilization of the torso in movements such as rond de jambe, which may require internal stabilization techniques in center; (3) turn initiations using the barre cannot be executed in center work in the same manner; (4) in summary, the barre has important uses but some of the ways it is currently used may not be transferable to work without a barre.

Unpublished research by Sugano and Laws (2002) indicated that large forces can be exerted on the barre which may substitute for proper muscle use rather than subtly helping to develop technique. The hand that holds the barre may in fact account for extensive changes in biomechanical function of the dancer, changing their alignment, muscle activation, and weight shift strategies. Sugano and Laws identified that dancers may exert strong longitudinal forces on the barre to force turnout; that is, dancers place their feet in an externally rotated position that is beyond the anatomical capacity of the joints of the lower extremities. If the dancer then releases their hand from the barre, the body will rotate towards the barre around a vertical axis. Even when the dancer places a vertical force down on to the barre, weight is borne at the shoulder and removed from the weight-bearing foot.

Wilmerding *et al.* (2001) found that the muscles of the standing leg (abductor hallicus and tibialis anterior) were far less active at barre than they were at center, when the body did not have this external support. It is possible that the results of Sugano and Laws work explain the findings of Wilmerding and researchers. Their findings do suggest that postural responses for balance may not be well trained at the barre. As a typical ballet devotes nearly 50% of the class period to barre-work, it is possible that barre does not accomplish the task that teachers think that it does. Further, devoting this extensive time to barre-work may deny dancers important experiences in center and travelling work, which is essential in fully preparing them for dance practice and performance.

Preparation for jumps and execution of jumps

The end of a barre concludes with big kicks, or grand battement. Grand battement are known to be the precursor to many jump skills, preparing the gesture leg to develop speed and power to propel the body into the air. Lawson (1975) states "…the dancer must clearly understand that the working leg alone performs" (p. 71). The landmark work of Ryman and Ranney (1978) compared four dancers executing a grand battement. They used electromyography and rudimentary motion analysis and noticed that the gesture leg bent in the initiation of the movement, the pelvis tilted posteriorly, and turnout was not maintained in the gesture leg. The researchers suggested that many of the assumptions that dance teachers make in training this movement are not supported by the results of their study. Their findings stand in stark contrast to Lawson's explanation of the same skill.

Preliminary findings in the research of Krasnow *et al.* (2011a) corroborate these results, observing the posteriorly tilted pelvis and the limited turnout of the gesture leg at the height of the grand battement. In a study using 42 dancers of various skill levels, they also found that apparently all dancers involuntarily flex their standing leg at the height of the grand battement.

Ryman (1978/79) studied one dancer's execution of six different jumps, making four conclusions: (1) deeper pliés do not yield higher elevation; in this study, the moderate pliés yielded the best results; (2) suspension at the top of an elevation step is an illusion; that is, the ascent and descent are one continuum; (3) for turning elevation steps, the turn must begin at pushoff, not at the top of elevation; and (4) the foot sickles at the moment of pushoff. All of these findings are contrary to instruction by dance teachers.

Dancers are regularly instructed to land all jumps by focusing on the heel making contact with the floor. Dozzi (1989) demonstrated that forced heel contact or what is called *pressing* the heels into the floor actually caused more "double striking of the heels on the floor," suggesting to the researchers that the teaching cue of pressing the heels to the floor in jump landings is not a good teaching tool and may in fact increase risk of injury.

Laws and Lee (1989) analyzed the grand jeté using videography. One professional dancer performed 10 of these leaps. The researchers calculated aspects of the grand jeté such as velocity and momentum. Results included the following: (1) the time that the head and torso move horizontally at the top of the jeté can be more than half of the flight time; (2) the jeté is less effective if turnout of the push-off foot is maintained during the take-off phase; and (3) about half of the energy of the total jeté is expended in the take-off.

Point 2 stands in stark contrast to the standard instruction to maintain turn-out at all times.

IMPLICATIONS

All told, the pedagogical principles that form the basis of the standard ballet class can be regarded as solid and safe. Class begins slowly and steps to be executed are advanced in speed slowly over the 1.5- to 2-hour class. Class begins with the external support of barre and moves to center. The center work begins slowly (adagio, pirouettes) and moves on to faster, larger jumping skills (petit allegro, grand allegro). The dancers begin in wide, stable stances that place minimal stress on the knee (2nd and 1st position), as found by Barnes *et al.* (2000), and moves carefully to positions of less stability over time (5th position, single leg balances). However, there appears to be a lack of understanding by many who teach dance about the actual biomechanics of steps or skills in ballet. Biomechanical research is beginning to uncover the mysteries of the actual difference between safe, aesthetically pleasing technique and faulty technique. The presumption is that as the body of knowledge develops, the dance teacher will have a greater ability to train a strong and flexible dancer whose health will not be compromised by injury.

Address for correspondence

Virginia Wilmerding, Department of Theatre and Dance, MSC04 2570, University of New Mexico, Albuquerque, New Mexico 87110, USA; *Email:* pett@unm.edu

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