

---

# Abstracts from the Current Literature

Gayanne Grossman, P.T., Ed.M., and Marliese Kimmerle, Ph.D.

**Burckhardt P, Wynn E, Krieg MA, Bagutti C, Faouzi M. The effects of nutrition, puberty and dancing on bone density in adolescent ballet dancers. J Dance Med Sci. 2011;15(2):51-60.**

On average, ballet dancers have a low bone mineral content, elevated fracture-risk, low body mass index, low energy intake and delayed puberty. This study of 127, 15-17 year old Caucasian and Asian pre-professional dancers examined dance exposure, pubertal delay and the influence of nutrition on bone mineral density. Many studies have demonstrated that teenage dancers limit their calorie intake, particularly with deficient proteins, minerals and vitamins, which contributes to health problems such as pubertal delay, low estrogen and bone loss. This study used the EAT-40 questionnaire and a three-day dietary record and found that food intake was below the recommendations for a normally active population, with the exception of non-dairy proteins such as meat, fish and eggs, which were twice the recommended amount. Dairy products, the major source of calcium, were below average. The imbalance between these two categories is a concern in terms of bone development. For this dancer population, the average Body Mass Index was below or near the lower normal limit for age and sex; they danced an average of 22 hours a week and menarche was delayed by 17 months. While the hours of dancing may be seen as having a positive effect on bone density, the very high energy expenditure must be met by a sufficient nutritional intake. Recommendations include the maintenance of appropriate weight gain during growth and a balanced diet avoiding excess intake of non-dairy proteins and increasing dairy, fruit and vegetables.

**Doyle-Lucas AF, Davy BM. Development and evaluation of an educational intervention program for pre-professional adolescent ballet dancers. Nutrition for optimal performance. J Dance Med Sci. 2011;15(2):65-75.**

The dance profession is well aware of the problems associated with severely restricted dietary intake and abnormal

eating behavior, therefore it is important to identify whether it is possible to effectively change this behavior with an educational program. A three-lecture DVD series was developed for use with 231, 13 to 18 year old pre-professional adolescent ballet dancers attending a summer intensive program. The aim of this intervention program was to increase knowledge of basic sports nutrition principles, inform them of the health risks of the Female Athlete Triad and to promote self-efficacy for adopting healthier habits. Students attended the lectures, received handouts and worksheets and were assessed using questionnaires at the beginning, completion and in a 6-week follow-up. Their results were compared with 90 dancers in the control group, and it was found that the intervention program was effective in increasing nutrition knowledge, perceived severity and self-efficacy. Although they declined by a six-week posttest, these measures still remained significantly improved from baseline. Improvements were also seen in self-reported dietary intake, including a decline in fat, candy and fast food intake, and an increase in milk and water consumption. The study demonstrated that an education program administered to dancers enrolled in three different elite professional ballet companies' summer intensives resulted in increased nutritional awareness and some changes in eating behavior. The DVD format allowed ease of program delivery and reproducibility. One of the recommendations is to include artistic directors, ballet instructors and families in long-term educational programs.

**Glasoe M, Yack HJ, Saltzman CL. Anatomy and biomechanics of the first ray: PhysTher. September 1999;79(9):854-859.**

The "first ray" is defined as the bones on the inside (medial side) of the foot, namely the first metatarsal and the first cuneiforms. It is a very important foot segment for dancers because it dissipates weight and is involved in propulsion; in other words, the first ray is vital for push off. This paper describes the anatomy of the first ray in detail and discusses its mechanics. The authors use the analogy of beams and

trusses to discuss foot mechanics. Beams are designed to be able to bend under certain forces. Trusses are triangular frames that have two rigid supports with a base. The first ray is an important part of the truss and beam mechanics of the foot. The authors also discuss the sesamoid bones, problems with a hypermobile and hypomobile first ray and bunions. Sesamoid bones are small bones under the head of the first metatarsal. They elevate the first ray, allow it to accept more weight, and help the intrinsic muscles function better. The joint between the first metatarsal and phalange (bigger bone in the foot and the toe bone) or the entire ray can move too much or too little affecting shock absorption or propulsion. A hypermobile first ray may facilitate a flattened arch. This is known as pronation, or “rolling in” to dancers. The authors discuss how a cause of bunions may be that hypermobility of the first ray (it moves too much) allows it to pronate, forcing the second metatarsal to accept too much of the weight. Pronation also interferes with the first ray becoming rigid during relevé. Dancers need this for stability and so balance will be easier. This article provides interesting anatomical descriptions, is specific and clearly written.

**Couillandre A, Lewton-Brain P, Portero P. Exploring the effects of kinesiological awareness and mental imagery on movement intention in the performance of demi-plié. *J Dance Med Sci.* 2008;12(3):91-98.**

These authors investigated improved dancer performance of demi-plié when kinesiological explanations and mental imagery were used as cues. Dancers from Les Ballets de Monte Carlo volunteered as subjects. The researchers applied surface electrodes to each dancer’s lower leg muscles: vastus lateralis, biceps femoris, tibialis anterior, and soleus muscles. Measurements were recorded for anteroposterior (front and back) and vertical acceleration. They also mea-

sured the angle of the knee joint with an electrogoniometer. The researchers looked at several conditions such as maximum knee flexion during demi-plié and jump. For the study, each dancer performed a first position demi-plié and jump. The researchers intervened by simulating what dancer teachers do in class. They explained to each dancer the kinesiological principles of the movements and then offered some imagery to help the dancer integrate understanding and sensation. For example, one of the images was “an arrow was passing from above the knee cap, down and out through the back of the heel, and continuing down another few meters.” Another image was, “The heels being like the prow of a ship leaving the dock; they slowly initiate the movement, followed by the rest of the foot and the legs.” After data analysis, the authors found no difference knee flexion during demi-plié. Muscle activity of the biceps femoris was greater with kinesiological explanations and imagery while going up from demi-plié. There were no changes noted in jump height, vertical acceleration and time to that height. Again, the biceps femoris was more active with the intervention while going down and up during jumping. The dancers exhibited less anteroposterior sway and less “bucking” while jumping because of the biceps femoris engagement. They engaged the tibialis anterior more and the vastus lateralis less. The authors suggest that the increased anterior tibialis recruitment could maintain the arch in the foot. Decreased vastus lateralis recruitment could be due to reduced strain on the anterior (front) side of the leg. This article compares multiple sources for cueing and feedback. It also provides some useful imagery examples for use in teaching correct demi-plié action and demonstrates that understanding kinesiological principles and using imagery can be effective in improving skill performance. The bibliography is particularly informative for teachers who are looking for related articles to read.