PERFORMING ARTS
SPECIAL INTEREST GROUP

ORTHOPAEDIC SECTION
AMERICAN PHYSICAL THERAPY ASSOCIATION

APTA
American Physical Therapy Association
The Science of Healing. The Art of Caring.

PASIG MONTHLY CITATION BLAST: No.66 **November 2011**

Dear PASIG members:

PASIG programming for CSM 2012 will occur on Friday, February 10th, from 8:00am to 12:30pm. Our PASIG business meeting will be held directly following the programming in the same room. Our program topic this year is "*The Core of the Matter: from the Hips to the Lips*" with Mary Massery, Jeff Stenback, and Amy Humphrey speaking.

Reminder: as we prepare for CSM 2012 and PASIG programming, please let me know if you are presenting performing arts-related research and I will be sure to include you in our calendar in our January Blast.

Elections for the Orthopaedic Section opened in early November. Please participate in voting. We have one elected position open, for the Nominating Committee. There are three candidates running: Rosie Canizares, PT, DPT; Danelle Dickson, PT, DPT; and Melissa Strzelinski, PT, MPT. Thank you again for agreeing to run.

Our new Research Committee Chair, Annette Karim PT, DPT, OCS, will begin to work with me in January, prior to CSM. Please let us both know of ideas you may have for research-related new projects or content for the PASIG Research Committee.

PERFORMING ARTS CONTINUING EDUCATION AND CONFERENCES

Performing Arts Independent Study Couses
Orthopaedic Section Independent Study Course. *20.3 Physical Therapy for the Performing Artist*.
Monographs are available for:
- Figure Skating (J. Flug, J. Schneider, E. Greenberg),
- Artistic Gymnastics (A. Hunter-Giordano, Pongetti-Angeletti, S. Voelker, TJ Manal), and
- Instrumentalist Musicians (J. Dommerholt, B. Collier).

Contact: Orthopaedic Section at: www.orthopt.org

Orthopaedic Section Independent Study Course. *Dance Medicine: Strategies for the Prevention and Care of Injuries to Dancers*.
This is a 6-monograph course and includes many PASIG members as authors.
- Epidemiology of Dance Injuries: Biopsychosocial Considerations in the Management of Dancer Health (MJ Liederbach),

- Nutrition, Hydration, Metabolism, and Thinness (B Glace),
- The Dancer's Hip: Anatomic, Biomechanical, and Rehabilitation Considerations (G. Grossman),
- Common Knee Injuries in Dance (MJ Liederbach),
- Foot and Ankle Injuries in the Dancer: Examination and Treatment Strategies (M. Molnar, R. Bernstein, M. Hartog, L. Henry, M. Rodriguez, J. Smith, A. Zujko),
- Developing Expert Physical Therapy Practice in Dance Medicine – (J. Gamboa, S. Bronner, TJ Manal).

Contact: Orthopaedic Section at: www.orthopt.org

Harkness Center for Dance Injuries, Hospital for Joint Diseases. Principles of Dance Medicine: Clinical management of the dancer patient. New York, NY, July 12 – 15, 2012. http://hjd.med.nyu.edu/harkness/education/healthcare-professionals/upcoming-educational-courses

Performing Arts Medical Association (PAMA). 30th Annual Symposium: Medical Problems of Performing Artists, Snowmass, CO, July 26 – 29, 2012. Contact: http://www.artsmed.org

International Association for Dance Medicine and Science: 22nd Annual Meeting, Singapore. October 25 – 28, 2012. Contact: http://www.iadms.org

For this November Citation BLAST, Tahira Collier compiled the topic, "Ankle Instability in Performing Artists." The format is an annotated bibliography of articles generally from the last decade. The PASIG Research Committee initiated this monthly Citation BLAST on performing arts-related topics in June 2005 in the hopes of encouraging our members to stay current in the literature and, perhaps, consider conducting research themselves. Each month we send a new list of performing arts (PA) citations to members of the PASIG to further the pursuit of PA-related scholarship. (Information about EndNote referencing software can be found at http://www.endnote.com, including a 30-day free trial).

Regards,
Shaw

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Chair, PASIG Research Committee
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Ankle Instability in Performing Artists

This topic was chosen to specifically address the issues revolving ankle instability in performing artists. In athletic and non-athletic populations, ankle sprains (particularly

inversion sprains) are the most common cause of instability at the ankle. However, other factors such as hypomobility at the midfoot, overuse injuries in the ankle region, and other intrinsic factors (e.g., posterior ankle impingement) can possibly contribute to ankle instability in the performing artist. In addition, incomplete or improper rehab of ankle injuries, and instability over extended periods may lead to chronic conditions (i.e., pain, chronic instability) and a decrease in overall performance level.

Ankle instability can be categorized as functional or mechanical instability. For example, one may clinically present with excessive ankle passive ROM and joint laxity but have enough ankle strength and proprioception to overcome this when performing certain tasks. On the other hand, one may have normal ROM, but have deficits in strength and proprioception that make it functionally unstable with certain tasks. Persistent instability and repeated ankle sprains can lead to chronic ankle instability (CAI).

While there is much literature discussing ankle instability in the general population and more common types of athletes, the following articles are mostly specific to dancers, with one relating to musicians and one to gymnasts. The articles directly (and in some cases indirectly) address causes and associated mechanisms of injury, signs and symptoms, assessment and classification, potential negative outcomes, and treatment options for ankle instability.

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Arampatzis A, Morey-Klapsing G, Brüggemann GP. Orthotic effect of a stabilising mechanism in the surface of gymnastic mats on foot motion during landings. J Electromyogr Kinesiol. 2005; 15(5):507-15.

The purpose of this study was to examine two hypotheses: (a) mat hardness affects foot motion during landing; (b) the influence of a surface stabilising interface integrated in a mat on foot motion is detectable. Two studies were carried out: In the first one, six female gymnasts performed barefoot landings from different falling heights onto three mats having different hardness. In the second study, a stabilising mechanism was integrated in the surface of three new mats with different hardness. Three high speed video cameras (250Hz) captured the motion of the left leg and foot. These were modelled by means of a four rigid body system. The maximal eversion at the ankle joint was not influenced by the different mats (hard: 4.6 degrees +/-1.9 to 9.3 degrees +/-3.4, medium: 3.1 degrees +/-2.7 to 7.4 degrees +/-3.5, soft: 4.8 degrees +/-2.1 to 8.4 degrees +/-3.5). The soft mat without the stabilised surface showed higher eversion values ($p<0.05$) between forefoot and rearfoot (medial joint: hard: 5.1 degrees +/-3.2 to 7.3 degrees +/-3.3, medium: 6.9 degrees +/-3.1 to 7.5 degrees +/-2.9, soft: 12.7 degrees +/-4.1 to 13.4 degrees +/-3.3; lateral joint: hard: 8.5 degrees +/-3.1 to 9.7 degrees +/-1.1, medium: 9.5 degrees +/-2.6 to 11.2 degrees +/-3.3, soft: 12.1 degrees +/-2.3 to 15.7 degrees +/-3.3). For the mats with the surface stabilising interface, the different hardness did not cause any significant differences in maximal eversion values at the medial (hard: 1.5 degrees +/-3.3 to 5.5 degrees +/-4.5, medium: 1.3 degrees +/-3.5 to 5.1 degrees +/-3.6, soft: 0.7 degrees +/-4.9 to 5.4 degrees +/-4.2) nor at the lateral (hard: 11.3 degrees +/-4.2 to 17.3 degrees +/-4.2, medium: 12.3 degrees +/-4.8 to 17.1 degrees +/-3.7, soft: 11.5 degrees +/-4.6 to 17.1 degrees +/-4.3) forefoot joints. The structure of the mat and the consequent deformation hollow did not influence the kinematics of the ankle joint during landings, but it influenced the motion at the medial and the lateral forefoot

joints. By means of a stabilised surface, it is possible to reduce the influence of mat deformation on the maximal eversion between forefoot and rearfoot.

Cloak R, Nevill AM, Clarke F, Day S, Wyon MA. Vibration training improves balance in unstable ankles. Int J Sports Med. 2010; 31(12):894-900.

Functional ankle instability (FAI) is a common condition following ankle injury characterised by increased risk of injury. Ankle sprains are a common acute form of injury suffered in dancing and loss of balance can affect not only risk of injury risk but also performance aesthetics. Whole body vibration training (WBVT) is a new rehabilitation method that has been linked with improving balance and muscle function. 38 female dancers with self reported unilateral FAI were randomly assigned in 2 groups: WBVT and control. Absolute centre of mass (COM) distribution during single leg stance, SEBT normalised research distances and Peroneus longus mean power frequency (f(med)) where measured pre and post 6-week intervention. There was a significant improvement in COM distribution over the 6 weeks from 1.05 ± 0.57 to 0.33 ± 0.42 cm² ($P<0.05$), and 4 of the 8 planes of direction in the SEBT Ant, Antlat, Med and Antmed from 77.5 ± 7.1 to 84.1 ± 5.8% ($P<0.05$) compared to control groups during the course of the 6 week training intervention. There was no evidence of improvement in peroneus longus (f(med)) over time ($P=0.915$) in either group. WBVT improved static balance and SEBT scores amongst dancers exhibiting ankle instability but did not affect peroneus longus muscle fatigue.

Distefano A, Schon LC. Management of Posterior Ankle Impingement as a Result of Ankle Instability - A Case Report. J Dance Med Sci. 2002; 6(4):128-132.

Dancers may suffer from either anterolateral ankle instability secondary to recurrent inversion ankle sprains or posterior ankle impingement syndrome secondary to a large trigonal process or os trigonum. Ankle instability may cause posterior impingement syndrome by allowing the forward shift of the talus in the mortise during plantar flexion. Identifying the interrelationship between instability and impingement is a key step in returning the patient to dance. We describe the results of a dancer who presented with both anterolateral ankle instability and posterior ankle impingement, the surgical procedure used, and the comprehensive, dance-specific treatment protocol implemented to achieve a successful outcome.

Eils E, Imberge S, Völker K, Rosenbaum D. Passive stability characteristics of ankle braces and tape in simulated barefoot and shoe conditions. Am J Sports Med. 2007; 35(2):282-7.

BACKGROUND: Ankle sprains are among the most common injuries in barefoot sport activities such as dance, gymnastics, or trampoline. At present, the use of external ankle devices for prevention of ligament injuries for barefoot activities remains unclear. HYPOTHESIS: External ankle devices have a significant loss of passive stability when used without a shoe in barefoot activities. STUDY DESIGN: Controlled laboratory study. METHODS: Twenty-five healthy subjects participated in the project (mean age, 26.2 +/- 3.3 years; mean body mass, 71.2 +/- 10.3 kg; mean height, 178 +/- 7 cm). Passive range of motion measurements were performed with 3 different ankle stabilizers (a stirrup brace, a lace-up brace, and tape), as well as 2 different shoe conditions (cutout shoe [simulated barefoot] and normal shoe). RESULTS: In the simulated barefoot condition, a significantly reduced stabilizing effect for inversion and eversion (19% and 29%, respectively) was found for the stirrup ankle brace. Small decreases were noted with the soft brace and tape, but these were not statistically significant. CONCLUSION: The passive stability characteristics of ankle braces depend to a great extent on being used in combination with a shoe. This is especially true for semirigid braces with stirrup design. Therefore, it is recommended that soft braces (like the one tested in the present investigation) be used in barefoot sports for restricting passive range of motion of the foot and ankle complex. CLINICAL RELEVANCE: This study provides useful information for clinicians to select or recommend an external

ankle stabilizing device in barefoot sports to restrict passive range of motion of the foot-ankle complex most effectively.

Hamilton WG, Thompson FM, Snow SW. The modified Brostrom procedure for lateral ankle instability. Foot Ankle. 1993; 14(1):1-7. Erratum in Foot Ankle 1993 Mar-Apr;14(3):180.
Twenty-eight ankles in twenty-seven patients (average age 28) underwent the Gould modification of the Brostrom repair for symptomatic lateral ankle instability. Fifty-four percent were high level professional ballet dancers, 35% were recreational athletes, and 11% were nonathletes. Follow-up averaged 64.3 months (range 30-132 months). Of the 28 operations performed, there were 26 excellent results, one good result, and one fair result. All the professional dancers obtained excellent results. There were no failures, stretch-outs, re-dos, or complications. This operation is believed to be an excellent choice for the dancer, athlete, or nonathlete who needs a stable ankle with a full range of plantarflexion and dorsiflexion and normal peroneal function.

Hiller CE, Kilbreath SL, Refshauge KM. Chronic ankle instability: evolution of the model. J Athl Train. 2011; 46(2):133-41.
CONTEXT: The Hertel model of chronic ankle instability (CAI) is commonly used in research but may not be sufficiently comprehensive. Mechanical instability and functional instability are considered part of a continuum, and recurrent sprain occurs when both conditions are present. A modification of the Hertel model is proposed whereby these 3 components can exist independently or in combination. OBJECTIVE: To examine the fit of data from people with CAI to 2 CAI models and to explore whether the different subgroups display impairments when compared with a control group. DESIGN: Cross-sectional study. PATIENTS OR OTHER PARTICIPANTS: Community-dwelling adults and adolescent dancers were recruited: 137 ankles with ankle sprain for objective 1 and 81 with CAI and 43 controls for objective 2. INTERVENTION(S): Two balance tasks and time to recover from an inversion perturbation were assessed to determine if the subgroups demonstrated impairments when compared with a control group (objective 2). MAIN OUTCOME MEASURE(S): For objective 1 (fit to the 2 models), outcomes were Cumberland Ankle Instability Tool score, anterior drawer test results, and number of sprains. For objective 2, outcomes were 2 balance tasks (number of foot lifts in 30 seconds, ability to balance on the ball of the foot) and time to recover from an inversion perturbation. The Cohen d was calculated to compare each subgroup with the control group. RESULTS: A total of 56.5% of ankles (n = 61) fit the Hertel model, whereas all ankles (n = 108) fit the proposed model. In the proposed model, 42.6% of ankles were classified as perceived instability, 30.5% as recurrent sprain and perceived instability, and 26.9% as among the remaining groups. All CAI subgroups performed more poorly on the balance and inversion-perturbation tasks than the control group. Subgroups with perceived instability had greater impairment in single-leg stance, whereas participants with recurrent sprain performed more poorly than the other subgroups when balancing on the ball of the foot. Only individuals with hypomobility appeared unimpaired when recovering from an inversion perturbation. CONCLUSIONS: The new model of CAI is supported by the available data. Perceived instability alone and in combination characterized the majority of participants. Several impairments distinguished the sprain groups from the control group.

Hiller CE, Refshauge KM, Beard DJ. Sensorimotor control is impaired in dancers with functional ankle instability. Am J Sports Med. 2004; 32(1):216-23.
BACKGROUND: Factors potentially causing chronic instability after ankle inversion sprains have rarely been examined during the injuring movement.
PURPOSE: To compare control of ankle movement during quiet stance and after inversion perturbation in chronically unstable ankles (n = 16) with healthy controls (n = 26).
METHODS: Movement control was measured as magnitude of lateral ankle oscillation,

using 3SPACE Fastrak during single leg stance (baseline oscillation) in two foot positions, flat and demi-pointe. In both positions, time to resume baseline oscillation after inversion perturbation (perturbation time) of 15 degrees for the flat foot and 7.5 degrees on demi-pointe was also determined. RESULTS: Baseline oscillation on demi-pointe was significantly smaller (P < 0.005) for the sprained group (2.5 +/- 0.5 mm) than for controls (4.0 +/- 2.3 mm). Perturbation time for the flat foot was significantly longer (P < 0.05) for the sprained group (2.2 +/- 0.4 seconds) than for controls (1.8 +/- 0.5 seconds). However, failure rate was higher (P < 0.05) among the sprained group than controls for perturbation with the foot flat and baseline oscillation on demi-pointe. CONCLUSIONS: Findings demonstrated altered sensorimotor control in chronically unstable ankles. Those sprainers who successfully completed the tasks minimized oscillation. The impairments in the sprained group may reflect deficits in either movement detection, peroneal muscle response, or both.

Hiller CE, Refshauge KM, Herbert RD, Kilbreath SL. Intrinsic predictors of lateral ankle sprain in adolescent dancers: a prospective cohort study. Clin J Sport Med. 2008; 18(1):44-8.

OBJECTIVE: To identify intrinsic predictors of lateral ankle sprain. DESIGN: Prospective cohort study. SETTING: A performing arts secondary school and a dance school. PARTICIPANTS: One hundred fifteen adolescent dancers (94 female and 21 male) entered the study. One ankle of each dancer was randomly assigned to a test group (n = 114), and the other was assigned to a validation group (n = 112). PREDICTORS: Eighteen measures, including age, dance history, previous ankle sprain, ankle and foot laxity and range of motion, and balance from test ankles were entered into a backwards stepwise Cox regression model. The model generated with the test group was used to predict ankle sprains in the validation group. MAIN OUTCOME MEASURE: Time to first lateral ankle sprain. RESULTS: An increased risk of sprain in the test group was predicted by younger age [hazard ratio (HR) = 0.65, 95% CI 0.45-0.94], previous sprain of the contralateral ankle (HR = 3.76, CI 1.24-11.40), increased passive inversion range (HR = 1.06, CI 1.00-1.12), and inability to balance on demipointe (HR = 3.75, CI 1.02-13.73). Of these predictors, only previous sprain of the contralateral ankle significantly predicted ankle sprain in the validation group (HR = 3.90, CI 1.49-10.22). The predictive accuracy of this variable was not strong (positive likelihood ratio of 2.01 and negative likelihood ratio of 0.45). CONCLUSION: A history of previous lateral ankle sprain is associated with an increase in the risk of future sprain of the contralateral ankle.

Leanderson J, Eriksson E, Nilsson C, Wykman A. Proprioception in classical ballet dancers. A prospective study of the influence of an ankle sprain on proprioception in the ankle joint. Am J Sports Med. 1996; 24(3):370-4.

We studied prospectively the influence of ankle sprains on proprioception as measured by recording the postural sway of classical ballet dancers. Excellent balance and coordination are important for classical ballet dancers, and postural stability requires adequate proprioception from the ankle joint. Fifty-three professional dancers from the Royal Swedish Ballet, Stockholm, and 23 nonathletes, the control group, participated in the investigation. Postural sway was recorded and analyzed with a stabilimeter using a specially designed, portable, computer-assisted force plate. Six dancers sustained ankle sprains during followup. The recordings were obtained of these dancers before and after the injuries. The stabilometry results differed among the male and female dancers and the control group as follows: 1) the male dancers demonstrated a smaller total area of sway, and 2) both the male and female dancers had a smaller mean sway on the left foot than on the right (no mean difference in sway was found between the left and right foot in the control group). In comparison with the condition before injury and with the uninjured foot, the postural stability of the dancer was impaired for several weeks after the ankle sprain. Postural stability gradually improved during rehabilitation and improvement still occurred several weeks after

professional dancing had resumed. CLINICAL RELEVANCE: This study is a first step in understanding that injured ballet dancers do not have the same postural stability as uninjured dancers and that it is even inferior to that of nondancers, which is important to understand for further study on rehabilitation. The future development of effective balance training programs for ballet dancers with ankle injuries should emphasize improvements in medial-lateral directional balance.

Lin CF, Lee IJ, Liao JH, Wu HW, Su FC. Comparison of postural stability between injured and uninjured ballet dancers. Am J Sports Med. 2011; 39(6):1324-31.

BACKGROUND: Ballet movements require a limited base of support; thus, ballet dancers require a high level of postural control. However, postural stability in ballet dancers is still unclear and needs to be understood. PURPOSE: To evaluate ballet dancers' postural stability in performing single-leg standing, the en pointe task, and the first and fifth positions and to determine differences in task performance among healthy nondancers, healthy dancers, and dancers with ankle sprains. STUDY DESIGN: Controlled laboratory study. METHODS: Injured dancers, uninjured dancers, and nondancers were recruited for this study (N = 33 age-matched participants; n= 11 per group). The tasks tested were single-leg standing with eyes open and closed, first position, fifth position, and en pointe. Center of pressure parameters were calculated from the ground-reaction force collected with 1 force plate. Analysis of variance was used to assess the differences of center of pressure parameters among 3 groups in single-leg standing; independent t test was used to examine the differences of center of pressure parameters between injured and uninjured dancers. RESULTS: During single-leg standing, injured dancers had significantly greater maximum displacement in the medial-lateral direction and total trajectory of center of pressure, compared with the uninjured dancers and nondancers. During the first and fifth positions, the injured dancers demonstrated significantly greater standard deviation of center of pressure position in the medial-lateral and anterior-posterior directions, compared with the uninjured dancers. During en pointe, the injured dancers had significantly greater maximum displacement in the medial-lateral direction and the anterior-posterior direction, compared with the uninjured dancers. CONCLUSION: The injured and uninjured dancers demonstrated differences in postural stability in the medial-lateral direction during single-leg standing and the ballet postures. Although the injured dancers received ballet training, their postural stability may still be inferior to that of the nondancers.

Ménétrey J, Fritschy D. Subtalar subluxation in ballet dancers. Am J Sports Med. 1999; 27(2):143-9.

Ankle injuries frequently occur in dancers. Among these injuries, only a few cases of talar subluxation have been reported in the literature. In our series, we diagnosed and treated 25 subtalar subluxations over a 1-year period in the Ballet Béjart Lausanne company. The subluxations occurred after a grand plie on pointes or at the landing of a jump on demi-pointes, without any mechanism of ankle sprain. The dancer usually noted a sudden and sharp pain in the talonavicular joint and hindfoot with a feeling of "forward displacement" of the foot. At palpation, the talonavicular ligament, the anterior talofibular ligament, and the posteromedial part of the subtalar joint were painful. A limitation of the ankle extension and a clear hypomobility of the subtalar joint were noted. Under the effect of shearing forces on the midtarsal joint, a posteromedial subtalar subluxation occurred. Treatment consisted of a manipulation that reduced the subluxation. Continuous taping, which locks the talonavicular joint in the anterior direction, was recommended for 6 weeks. Dancing could be resumed in a swimming pool after 2 weeks, and on the ground after 3 to 4 weeks. We found that subluxation could recur, and that it could eventually become chronic.

O'Loughlin PF, Hodgkins, CW, Kennedy JG. Ankle sprains and instability in dancers. Clin Sports Med. 2008; 27(2):247-62.

Ankle inversion injuries are the most common traumatic injuries in dancers. Ankle stability is integral to normal mobilization and to minimizing the risk for ankle sprain. The ability of the dynamic and static stabilizers of the ankle joint to maintain their structural integrity is a major component of the normal gait cycle. In the world of dance, this quality assumes even greater importance given the range of movement and stresses imposed on the ankle during various dance routines.

Punwar S, Madhav R. Dislocation of the calcaneocuboid joint presenting as lateral instability of the ankle. J Bone Joint Surg Br. 2007; 89(9):1247-8.

A 16-year-old professional female ballet student sustained a plantar flexion-inversion injury to her left ankle while dancing. Clinical examination and MRI suggested subluxation of the tibiotalar joint. However, accurate diagnosis was hampered by a transient palsy of the common peroneal nerve. It was subsequently established that she had also sustained a dislocation of her calcaneocuboid joint, a rare injury, which was successfully stabilised by using a hamstring graft. The presentation and management of this rare condition are discussed.

Rein S, Fabian T, Zwipp H, Heineck J, Weindel S. The influence of profession on functional ankle stability in musicians. Med Probl Perform Art. 2010; 25(1):22-8.

OBJECTIVE: The aim of this study was to examine the influence of extensive work-related use of the feet on functional ankle stability among musicians.
METHODS: Thirty professional organists were compared to professional pianists and controls. All participants completed a questionnaire. Range of motion (ROM), peroneal reaction time, and positional sense tests of the ankle were measured. The postural balance control was investigated with the Biodex Stability System for the stable level 8 and unstable level 2. Statistical analysis was done with the Kruskal-Wallis test, Mann-Whitney test with Bonferroni-Holm correction, and Fisher's exact test. RESULTS: Nine of 30 organists compared to 5 of 30 pianists and controls reported ankle sprains in their medical history. Pianists had a significant increased flexion of both ankle joints compared to organists ($p < 0.01$) and increased flexion of the right ankle joint compared to controls ($p = 0.02$). The positional sense test and postural balance control showed no significant differences among groups. The peroneal reaction time of the right peroneus longus muscle was significantly increased in pianists compared to controls ($p = 0.008$). CONCLUSIONS: Organists have shown a high incidence of ankle sprains. Despite their extensive work-related use of the ankle joints, organists have neither increased functional ankle stability nor increased ROM of their ankle joints in comparison to controls. Pianists have increased flexion of the ankle joint, perhaps due to the exclusive motion of extension and flexion while using the pedals. To minimize injuries of the ankle and improve functional ankle stability as well as balance control, proprioceptive exercises of the ankle in daily training programs are recommended.

Ritter S, Moore M. The relationship between lateral ankle sprain and ankle tendinitis in ballet dancers. J Dance Med Sci. 2008; 12(1):23-31.

The lateral ligament complex of the ankle is the most frequently injured structure in the body. Although most simple ankle sprains do not result in long-term disability, a significant number do not completely resolve, leading to residual symptoms that may persist for years. The most commonly reported symptoms, particularly among athletes, include instability, re-injury, and tendinitis. Ballet dancers are a combination of artist and high-performance athlete; consequently, they are subjected to the same types of injuries as other athletes, including lateral ankle sprains and their sequelae. Furthermore, ballet dancers perform in unusual positions such as en pointe, which places the ankle in extreme plantar flexion, requiring stabilization by surrounding muscles. Dancers' extraordinary performance demands place them at risk for other ankle injuries as well, including inflammation of several tendons, especially the peroneals. This report reviews the relevant literature to

characterize the scope of lateral ankle sprains and sequelae, discuss the importance of the peroneal muscles in ankle stability, and explore a relationship between lateral ankle sprain and ankle tendinitis in ballet dancers. Informal interviews were conducted with physical therapists who specialize in treating ballet dancers, providing a clinical context for this report. An extensive review of the literature was conducted, including electronic databases, reference lists from papers, and relevant reference texts. Numerous studies have investigated ankle sprains and residual complaints; nearly all report that lateral ankle sprains commonly lead to chronic ankle instability. Studies exploring ankle stability have demonstrated that the peroneal muscles play a crucial role in ankle stabilization; EMG studies confirm they are the first to contract during ankle inversion stress. The dancer's need for exceptional ankle stabilization may lead to peroneal overuse and tendinitis. Studies have linked peroneal pathology to a history of ankle sprain, but there is no dance medicine literature linking peroneal tendinitis to prior ankle sprains. A growing body of literature confirms myriad connections between lateral ankle sprains, residual instability, peroneal muscle increased activity, and tendinitis. It is our belief that ankle sprains lead to instability, particular en pointe, for which the peroneal muscles attempt to compensate. Their overuse for this static stabilizing function, as well as for dynamic dance movements, then leads to tendonitis. This knowledge may heighten awareness of the potential for developing tendonitis following ankle sprains, and lead to better rehabilitation of the injured ballet dancer.