



**PASIG MONTHLY CITATION BLAST: No.92**

**April 2014**

Dear Performing Arts SIG members:

Our second **annual Orthopaedic Section Meeting** will be **May 15-17, 2014, in St. Louis, Missouri**, at the Hyatt Regency at the Arch. The two-day meeting will focus on: ***"The Triangle of Treatment: Integrating Movement System Impairments, Manual Therapy and the Biopsychosocial Approach in the Treatment of the Upper Quarter"***

This is a unique 2-day meeting focusing on the latest clinical strategies in the clinical management of the upper quarter. The format will include lecture and laboratory experiences with outstanding speakers who are experts in their fields and leaders in clinical research. The breakout lab sessions are small in size to allow for hands-on instruction and feedback from the presenters and lab assistants. The general sessions will consist of a panel of speakers who will discuss how to integrate physical therapy treatments to achieve the best outcomes for patients with Upper Quarter dysfunctions. Attendees will have the ability to choose among multiple breakout sessions during both days of the conference.

For registration information, please go to:

<https://www.orthopt.org/content/home>

**If you are looking to increase your involvement with PASIG, we are currently looking for a PASIG member to fill the position of PR Chair.** If you are interested in serving in any way, or would like further information on this position's job description, please contact Rosie Canizares, Nominating Chair: [Caniz002@duke.edu](mailto:Caniz002@duke.edu)

**Performing Arts Clinical Affiliation Sites: Please update your current info for the PASIG.** You can send any updates to Mark Sleeper:  
[m-sleeper@northwestern.edu](mailto:m-sleeper@northwestern.edu)

**Don't forget to update your Orthopaedic Section and PASIG membership!** You will find links to the website for updating at the end of this blast. Also, please contact Amanda Blackmon, membership chair, to make sure she has your current information for receiving blasts and updates as well as confirming your membership: [Mandy@onetherapy.com](mailto:Mandy@onetherapy.com)

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### **Research Call to action:**

1. We still need writers for the 2014 Citation blasts!!! These are put together on a monthly basis. Please contact me for more information, at [brookerwinder@gmail.com](mailto:brookerwinder@gmail.com). Go to the website to look at topics that have been covered, add new content or update old citation topics: [http://www.orthopt.org/content/special\\_interest\\_groups/performing\\_arts/citations\\_endnotes](http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes)
2. We need case reports and original research papers that focus on clinical applications to the care of performing artists to publish in our quarterly Orthopaedic Practice Magazine, in the PASIG pages. Orthopaedic Practice Magazine is a great way of getting your case reports, original research, and clinical pearls into the hands of our PASIG members. Please contact Annette Karim if you are interested in submitting your writing: [neoluvsonlyme@aol.com](mailto:neoluvsonlyme@aol.com)
3. If you are seeking research participants, or are seeking a researcher to work with your potential participants, contact both Brooke Winder, Research Chair: [Brookerwinder@gmail.com](mailto:Brookerwinder@gmail.com) and Amanda Blackmon, Membership Chair: [mandy@onetherapy.com](mailto:mandy@onetherapy.com)
4. We are working on creating a brief dance screen as a resource for the PASIG website. The new contact for dance screening is Sarah Wegner: [Sbw28@drexel.edu](mailto:Sbw28@drexel.edu)

This month's citation blast is a collection of abstracts focused on common work-related injuries in retired dancers. Melanie Carminati, a PT student from Drexel University, was this month's contributor. This is a great collection reminding us of the continued importance of caring for performing artists not only to prolong their current careers, but also to improve their quality of life as they retire. Thank you, Melanie!

The practice of compiling abstracts has been an easy way for interns and clinicians to provide content for a citation blast as well as prepare for a clinical inservice or case study report. Please consider compiling Performing Arts-related abstracts for a citation blast this year. It's easy to do, and a great way to become involved with

PASIG! Just take a look at our Performing Arts Citations and Endnotes, look for what's missing, and email me your contribution or ideas on future citation blasts. ([brookeRwinder@gmail.com](mailto:brookeRwinder@gmail.com))

[http://www.orthopt.org/content/special\\_interest\\_groups/performing\\_arts/citations\\_endnotes](http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes)

Best regards,

*Brooke*

Brooke Winder, PT, DPT, OCS  
Chair, PASIG Research Committee  
*Director of Physical Therapy, The Cypress Center, Pacific Palisades, CA*  
Home: [brookeRwinder@gmail.com](mailto:brookeRwinder@gmail.com) Work: [brooke@thecypresscenter.com](mailto:brooke@thecypresscenter.com)

**PASIG Research Committee members:**

Shaw Bronner PT, PhD, OCS, [sbronner@liu.edu](mailto:sbronner@liu.edu)  
Jeff Stenback PT, OCS, [jsptocs2@hotmail.com](mailto:jsptocs2@hotmail.com)  
Sheyi Ojofeitimi PT, DPT, OCS, [sojofeit@gmail.com](mailto:sojofeit@gmail.com)  
Susan D. Fain PT, DMA, [sfain@ptcentral.org](mailto:sfain@ptcentral.org)  
Laura Reising, MS, PT, DPT, [lbreising@gmail.com](mailto:lbreising@gmail.com) (EndNote Organizer)

PERFORMING ARTS CONTINUING EDUCATION, CONFERENCES, AND RESOURCES

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](http://www.orthopt.org)

Orthopaedic Section-American Physical Therapy Association,  
Performing Arts SIG

[http://www.orthopt.org/content/special\\_interest\\_groups/performing\\_arts](http://www.orthopt.org/content/special_interest_groups/performing_arts)

Performing Arts Citations and Endnotes

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ADAM Center

<http://www.adamcenter.net/>

Publications:

<http://www.adamcenter.net/#!vstc0=publications>

Conference abstracts:

<http://www.adamcenter.net/#!vstc0=conferences>

Dance USA

<http://www.danceusa.org/>

Research resources:

<http://www.danceusa.org/researchresources>

Professional Dancer Annual Post-Hire Health Screen:

<http://www.danceusa.org/dancerhealth>

Dancer Wellness Project

<http://www.dancerwellnessproject.com/>

Becoming an affiliate:

<http://www.dancerwellnessproject.com/Information/BecomeAffiliate.aspx>

Harkness Center for Dance Injuries, Hospital for Joint Diseases

<http://hjd.med.nyu.edu/harkness/>

Continuing education:

<http://hjd.med.nyu.edu/harkness/education/healthcare-professionals/continuing-education-courses-cme-and-ceu>

Resource papers:

<http://hjd.med.nyu.edu/harkness/dance-medicine-resources/resource-papers-and-forms>

Links:

<http://hjd.med.nyu.edu/harkness/dance-medicine-resources/links>

Informative list of common dance injuries:

<http://hjd.med.nyu.edu/harkness/patients/common-dance-injuries>

Research publications:

<http://hjd.med.nyu.edu/harkness/research/research-publications>

International Association for Dance Medicine and Science (IADMS)

<http://www.iadms.org/>

Resource papers:

<http://www.iadms.org/displaycommon.cfm?an=1&subarticlenbr=186>

Links:

<http://www.iadms.org/displaycommon.cfm?an=5>

Medicine, arts medicine, and arts education organization links:

<http://www.iadms.org/displaycommon.cfm?an=1&subarticlenbr=5>

Publications:

<http://www.iadms.org/displaycommon.cfm?an=3>

Performing Arts Medicine Association (PAMA)

<http://www.artsmed.org/>

<http://www.artsmed.org/symposium.html>

Interactive bibliography site:

<http://www.artsmed.org/bibliography.html>

Related links:

<http://www.artsmed.org/relatedlinks.html>

Member publications:

<http://artsmed.org/publications.html>

***(Educators, researchers, and clinicians, please continue to email your conference and continuing education information to include in future blasts)***

### **Work-Related Musculoskeletal Injuries in Retired Dancers**

The retired dance population presents with specific musculoskeletal injuries related to the high physical demands of their profession. Primarily these injuries can include, but are not limited to, early-onset osteoarthritis of the lower extremity, hip labral pathology, knee ligamentous injury, and foot/ankle pathology. This population is of particular interest to me because of the retired dancers I have encountered at Polestar Physical Therapy & Pilates Center of Miami. Prior to completing my final internship at Polestar, I focused my attention on the young, active dance population and did not consider how the work load required of these dancers will manifest in future degenerative injuries from a lifetime of performance and training. I've included articles related to musculoskeletal injuries in the retired dancer as well as articles about occupation-specific degenerative changes. Articles on this topic were difficult to find and most studies were conducted outside the U.S. I hope this citation blast will increase awareness of the often "forgotten population," and help provide insight about treatment of these artists.

*Melanie Carminati, SPT- Drexel University, Philadelphia, PA  
Polestar Physical Therapy & Pilates Center, Coral Gables, FL*

Andersson S, Nilsson B, Hessel T, et al. Degenerative joint disease in ballet dancers. *Clin Orthop Relat Res*. Jan 1989(238):233-236.

**Objective:** To examine a group of retired dancers in order to determine if higher incidence of lower extremity arthrosis was present over the general population. **Methods:** 44 dancers from international ballet companies were included. Average age of the dancers at time of study was 57 years and average years of classical ballet performed was 18 years. 15 of the dancers were men. History was taken as well as roentgenographs of hip, pelvis, knee, foot, and ankle. Osteoarthritis was defined as narrowing of the joint space. **Results:** Six cases of coxarthrosis led dancers to undergo total hip replacements. In those dancers with coxarthrosis, the length of dance career was greater than average in all cases of coxarthrosis. Four

cases of tibiofemoral arthrosis were reported and all four were symptomatic. One case of bilateral ankle arthrosis was reported. 24 dancers presented with first metatarsophalangeal joint arthrosis, this is a high prevalence compared to younger dancers. Discussion: These results reveal evidence that intense physical activity may cause coxarthrosis. It was stated that because of this occupation-related cause of coxarthrosis, dancers may be eligible for workman's compensation. The young dancers selected for ballet academies present with greater range of motion in upper and lower extremities. This range of motion is maintained into adulthood for female dancers. Joint laxity has been correlated with the development of osteoarthritis. Whether the selection process of these young dancers with increased range of motion or the extreme stress of dancing is the cause of coxarthrosis in dancers is undetermined. However, this study demonstrates the common joints affected by degenerative joint disease in ballet dancers. Future research is required to determine whether selection bias or workload is the cause of degenerative joint disease.

Buyls IR, Rietveld AB, Ourila T, Emerton ME, Bird HA. Total hip replacement in dancers. *Clin Rheumatol*. Apr 2013;32(4):511-514.

Study Design: Case report Introduction: A professional contemporary dancer underwent bilateral total hip replacements due to osteoarthritis and returned to stage performance. This report contains patient commentary as well as a retrospective literature review of total hip replacements in the dance population. Summary: The female dancer included in the case report danced professionally for about 15 years in the U.K.. This dancer had previous left knee surgery and ankle ligament shortening surgery in her teenage years. No family history of osteoarthritis (OA) was present. However, the individual's father had his first total hip replacement at 80. Left hip pain started at age of 33 and soon after arthroscopic surgery was performed for removal of a bony spur. During this arthroscopic surgery, severe OA was noticed as well as a labral tear. Decrease in range of motion and increase in pain commenced soon after this arthroscopy. Right hip pain began at this time as well. Total left hip replacement was completed first and one year later a right total hip replacement was conducted as well. Equal weight-bearing on both lower extremities was now feasible. Rehabilitation was successful and this dancer was able to return to stage performance. Patient commentary describes her struggles and previous treatments to relieve hip pain. She details how her left hip 'turn-out' is still better than her right. The dancer also explains how she was happy to be able to jump and walk pain-free. She also reported that her stage performance required great physical and emotional effort, but no high extensions or challenging lines. The literature review describes hip pain as a common complaint from dancers > 45 years of age and most

problems due to degenerative changes. All dancers who underwent total hip replacements returned to teaching dance. Leg length discrepancy without adduction contracture following surgery was a problem identified. This is most likely due to hypermobility combined with surgical attempts to acquire adequate tension with the components to prevent subluxation. Overall the number of total hip replacements in dancers is low compared to those age-matched controls. Clinical Rehabilitation Impact: Hip pain is a common complaint of active dancers. Dancers who undergo total hip replacements are able to return to dance, although limited in some technical aspects requiring extreme range of motions and positions. Improved rehabilitation guidelines are needed for dancers who undergo total hip replacements. These guidelines should enforce longer rehabilitation time because of the high physical demands of dance.

Dunleavy K. Outcomes of hip resurfacing in a professional dancer: a case report. *Physiother Theory Pract.* Feb 2012;28(2):142-160.

Study Design: Case report Introduction: In 1997 the Birmingham hip resurfacing arthroplasty (RSA) was made available for young adults with hip osteoarthritis. The implant incorporates a metal femoral head with short implant stem and metal acetabular component. The RSA prosthesis is smaller than standard total hip arthroplasty and the procedure can be performed via anterior, anterolateral, or posterior approach. This procedure offers improved bone conservation and easier revision alternatives than a total hip arthroplasty. RSA also provides an option for young active adults and those with hip dysplasia. However, there is little guiding evidence for the use of RSA with professional dancers. Currently recommendations for aggressive rehabilitation have been made based on the young age and high activity levels of those patients undergoing RSA. Professional dancers have an increased risk of early development of osteoarthritis due to the high intensity and repetitive nature of dance. Case Description: A female professional performer and modern/classical ballet instructor first experienced “popping and grinding,” in her right groin in her early twenties. She experienced pain with end range dance movements and decreased strength when holding leg in an elevated position. Manual therapy and therapeutic exercise brought minor relief. Osteoarthritis was diagnosed secondary to dysplasia via radiographs. Surgeon’s instructions following surgery were to resume normal activity at 8 weeks without aggressive stretching. At 8 weeks slight antalgic gait pattern with no assistive device was noted. Post-operative physical therapy was broken into five phases; starting with isometric contractions and range of motion and leading into progressive strengthening and muscle activation, strengthening with disassociation from lumbopelvic region, dynamic movement training, and finally dance-specific training. Outcomes: SAHQ, LEFS, and PSI were utilized as outcome measures.

Goals were achieved for internal rotation at 2 months, extension at 4 months, and flexion at 1 year. Abduction and external rotation was still not equal to the unaffected side at 1 year. Discussion: Progressive exercise program resulted in good outcomes and return to full teaching and professional company rehearsals were achieved after 7 months.

Conclusions: Dance-specific strengthening program for this specific case resulted in good functional and strength outcomes allowing for return to full professional duties by 7 months.

Duthon VB, Charbonnier C, Kolo FC, et al. Correlation of Clinical and Magnetic Resonance Imaging Findings in Hips of Elite Female Ballet Dancers. *Arthroscopy*. 2013;29(3):411-419.

Introduction: Extreme ranges of motion are utilized in ballet for aesthetic purposes. Turnout position is utilized in ballet movements and postures. Compensatory postural habits develop to achieve this turnout position and cause abnormal forces on the joints, ligaments, and muscles. Lower extremity and low back injuries are prevalent in the dance population. Dancers have an increased risk of early onset hip osteoarthritis of which femoroacetabular impingement is a risk factor. Purpose: 1) Evaluate hips of professional female dancers through passive range of motion measurement, 2) Identify femoroacetabular lesions which may correlate to groin pain, 3) Investigate whether femoroacetabular congruency is maintained in extreme movements (ex. split position on floor). Hypothesis: Extreme movements cause femoroacetabular abutments and femoral head subluxations. Methods: 20 female ballet dancers, mean age 26 years, and 14 active age-matched females were included in this study. All dancers had been dancing for more than 10 years. For the evaluation a questionnaire was utilized for identify pain location, aggravating factors, and functional limitations. The physical examination portion included range of motion measurements, anterior impingement special test, posterior impingement special test, and internal snapping hip test. MRI of pelvis was taken as well. Additional images were taken for the dancer subjects in extreme positions such as a split position. All morphological abnormalities were noted including acetabular dimensions, cartilage and labrum integrity. Results: The questionnaire revealed 4 dancers complaining of bilateral hip pain, 7 of right hip pain, and 1 of left hip pain. Pain only occurred when dancing at extreme range of motions (grand plié, grand battement a la seconde, etc.) and was in the inguinal region. For the physical examination, dancers had normal range of motions with increased abduction and external rotation, and decreased internal rotation. Anterior impingement test reproduced pain in 7 of the 20 dancers, posterior impingement test reproduced pain in 3 dancers, and internal snapping of the hip was only present in 2 dancers. MRI revealed normal morphological findings in dancers hips compared with controls. Three



types of lesions were discovered from imaging. These three include degenerative labral lesions, acetabular cartilage thinning with subchondral cysts, and herniation pits. Cartilage lesions were seen twice as much in dancers and more severe. Femoroacetabular congruency in extreme positions revealed femoral head subluxation of 2.05 mm. Discussion: Dancers had normal passive hip ROM and bony features, 60% complained of groin pain when dancing, most had labral and/or cartilage lesions and femoral head subluxation was present during extreme movements, no correlation was found between clinical and radiological results. Conclusions: Repetitive extreme movements can cause femoral head subluxations and femoroacetabular abutments in female ballet dancers who have normal hip morphology. This could cause early onset osteoarthritis.

Jacobsson B, Dalen N, Tjornstrand B. Coxarthrosis and labour. *Int Orthop*. 1987;11(4):311-313.

Objectives: To determine if environmentally associated stress will contribute to coxarthrosis. Methods: Two groups of Swedish male participants were included in this study, both experiencing hip pain. 85 males with primary coxarthrosis were on the waiting list for total hip arthroplasty and 262 male were urological patients. In 1960, 23% of the individuals worked as farmers, 45% were industrial workers, and the rest were transportation, trading, or administration professionals. A questionnaire incorporating medical history, specific hip pain questions, occupation specific labor questions, and physical activity questions were included. Radiographic films were taken as well. Results: 8% of the individuals with hyperplasia had radiographic signs of coxarthrosis with 5% having pain. Increased prevalence of coxarthrosis was found in patients whose professions involved heavy labor, farming, heavy lifting and tractor driving. Increased body weight was found to be linked to coxarthrosis prevalence as well. Discussion: There are an increased number of farmers who are coxarthrotic. Although no association between labor and coxarthrosis was found. Environmental stress associated with occupation of lifestyle, may attribute to development of coxarthrosis.

Rönkkö R, Helinvaara M, Malmivaara A, et al. Musculoskeletal Pain, Disability and Quality of Life Among Retired Dancers. *Journal of Dance Medicine & Science*. 2007;11(4):105-109.

Background: Job-related and sport-related loading increases the risk of lower extremity osteoarthritis (OA). Compared to the young dancers, the retired dance population has not been well researched. Many researchers conclude that dance injuries are overuse injuries resulting from repetitive microtrauma. Despite dance style, most injuries are lower extremity or low back. This study will examine self-reported musculoskeletal complaints,

pain, and disability of retired ballet and modern dancers. Objective: To determine the long-term effects of professional dance by comparing prevalence of musculoskeletal complaints between retired dancers and general populations. Methods: Subjects included were retired dancers from the Finnish National Ballet and retired dancers of the Union of Finnish Dance Artists. An age-matched group of non-dancer controls was chosen from the Finnish general population. A questionnaire was utilized to collect data regarding history of pain, disability and overall health. This questionnaire included questions regarding pain duration, location, functional limitations, as well as walking difficulties or limping. Results: 32 ballet dancers and 8 modern dancers completed the questionnaires. Mean age of ballet dancers was 59 years and average years danced was 33 years. Mean age of modern dancers was 50 and average years danced was 28 years. 19% of retired ballet dancers reported difficulty in walking or limping because of hip pain and 38% because of knee pain. 50% of retired modern dancers reported walking difficulty because of hip pain and 19% because of knee pain. 11% of ballet dancers and 6% of modern dancers reported ankle and foot troubles. Pain in any joint preceding 30 days was experienced by 78% of retired dancers. Ballet dancers rated their overall health better than controls; whereas modern dancers rated their overall health worse than controls. Discussion: Increased difficulty walking and limping because of hip or knee pain was reported in ballet and modern dancers compared to non-dancer controls. Back pain in the past month was more common in modern dancers. Some weaknesses of this study include small number of subjects and unclear questionnaire instructions. Overall, the risk of difficulty walking or limping because of hip or knee pain is increased in dancers. Retired dancers are still young and active in other ways besides professional dance. Preventative measures should be taken in regards to health and disability of retired dancers during their dance careers.

Rietveld AB. Dance injuries in the older dancer: Review of common injuries and prevention. . *Journal of Dance Medicine & Science*. 2000;4(1):20-22.

Study Design: Review Background: It was previously reported that the common injuries in older dancers involved the foot and knee: hallux rigidus, hallux valgus, and patellofemoral osteoarthritis. Further investigation is needed to determine the reasons for these dance specific injuries. Questions needing to be addressed include: what predisposing factors for these injuries exist and how can we prevent them? How can the dance world benefit from aging dancers and dance teachers? Summary: Compensation is often the cause of these knee and foot injuries. In order to compensate for lack of turnout in the hips dancers utilize Y-ligament and ilio-femoral ligament relaxation during flexion and abduction. This also allows for increased lumbar lordosis. Including demi-plié into this

allows for even more turnout. Finally, gripping the floor with both feet can create an extra torque and therefore increase turnout even more. Once knees are extended and spine straightened up the hips are forced passed the natural external rotation. The feet are excessively pronated. This common compensation sequence makes it clear the potential factors for knee, spine, hip, and feet injuries in older dancers. In the Netherlands, foot problems are the most common problems in dancers. Hallux rigidus can be an impairing condition for dancers because it is necessary for relevé and demi –pointe position to be achieved full extension of the big toe. Hallux valgus often is accompanied with a bunion. This big toe deformation is made worse by forcing external rotation of the leg to compensate for the lack of turnout from the hip. Knee disorders and injuries are the second most common injuries in dancers. The most common is patellofemoral osteoarthritis. Disturbance of normal gliding of the patella or malalignment can lead to this. Prevention of these injuries is possible through proper technique and alignment. Correcting dance technique and eliminating compensations can prevent injury. Complaints from older dancers are often due to osteoarthritis, which leads to permanent decrease in loadbearing capacity. Conclusion: Most injuries in older dancers involve hip, spine, knees, and feet. Faulty technique is often the cause of these patellofemoral osteoarthritis, hallux rigidus, and hallux valgus. Dance teachers play an extremely important role in prevention of these injuries. The dance community can continue to learn from these experienced dancers to help prevent injuries in younger dancers.

Rietveld B. Dance Injuries in the Older Dancer Comparison with Younger Dancers. *Journal of Dance Medicine & Science*. 2000;4(1):16-19.

Objectives: 1) How many older injured dancers seek treatment? 2) What is their mean age? 3) What is the male to female ratio of older dancers coming to the clinic? 4) Are they primarily dance teachers or performing dancers? 5) Are they active in classical ballet or other dance styles? 6) Which parts of the body do most injuries in older dancers occur? 7) What type of injuries? 8) Are there differences in injuries and their distribution between older dancers and with a control group of dancers of all ages?

Methods: 727 injured dancers and dance teachers from the Medical Centre for Dancers and Musicians in The Netherlands were utilized for subject selection. From this 66 injured older dancers 45 years of age or older were selected to form the study group. 345 dancers and dance teachers with injuries formed the reference group. The reference group age is lower than that of the study group and was used to compare data.

Results: The older dancers in the study group had an average age of 52 years with 9 males and 57 females. Majority of participants in this group were dance teachers. There were also 4 performing professional dancers,

7 retired professional dancers, 8 amateurs, and 3 who were considered, "miscellaneous." Classical ballet was the primary dance style practiced. Jazz was second most common followed by modern dance. Other dance styles practiced included ballroom, flamenco, bellydance, etc. The 66 older dancers had 92 injuries total. Whereas, the reference group of 345 dancers had 587 injuries. Most injuries occurred in the lower extremity for both groups. Ankle injury decreased from the reference group to the older dancers. Ankle injuries in the reference group included sprains, FHL tendonitis, and posterolateral impingement. The ankle injuries in older dancers were FHL tendonitis, chronic talocrural instability, and tear of the peroneus brevis tendon. Increased low back and hip injuries were found in the older dancers. The most common foot injury in the reference group was first MTP joint pathology; whereas, the older dancers most common injury was hallux rigidus. Knee problems were found in both groups. Discussion: There were more young subjects in the reference group than there were older dances in the study group. These injuries can't be correlated to the international dance population because this subject sample is of Dutch dancers who sought out treatment with this specific clinician in The Netherlands. Conclusion: The female, 52 year old, ballet teacher was predominately represented in this study. Most injuries were of the lower extremity included foot, knee, and ankle. For the younger dancers, the ankle was the primary problem. Knee problems in the older dancer were caused by degenerative changes mainly of the patellofemoral joint.

Teitz CC, Kilcoyne RF. Premature osteoarthritis in professional dancers. *Clin J Sport Med.* Oct 1998;8(4):255-259.

Background: The cause or reason for early retirement in the professional dance population is debated. The attributing factors often include loss of timing, agility, range of motion or pain. There has also been an increased prevalence of degenerative joint disease in retired ballet dancers. Proposed causes of this osteoarthritis have included microtrauma associated with dance and hypermobility. In specific patient populations including Ehlers-Danlos Syndrome, unstable joints caused by injury, and recurrently dislocating shoulders; hypermobility has been linked to premature osteoarthritis. There is contradictory evidence for this correlation of hypermobility and early degenerative changes in dancers and these topics have yet to be examined in the same study. Objective: 1) To decide if arthrosis onset begins at an earlier age in professional dancers, 2) Determine if there is an association between hypermobility and osteoarthritis in dancers, 3) Evaluate whether osteoarthritis is a contributing factor for retirement from professional dance. Methods: Interviews were conducted including fourteen retired professional dancers, five male and nine female, ranging from ages 26 to 47 with a minimum of

10 years of experience. Interview questions covered start of dance training, dance style, dance injuries, previous treatment, and time lost from performance. Family history, painful joints, scoliosis, bunion formation, current dance activities and reasons for retiring from dance were also included in the interview. A physical examination was incorporated as well for assessment of spine, range of motion of hips, knees, ankles, and subtalar joints. Knee stability and lower extremity alignment was assessed as well. Five tests were utilized to examine general ligamentous laxity. Radiographs of hips, knees, ankles, and feet of 14 dancers were taken as well as 36 radiographs of various joints of non-dancers. Findings included sclerosis, joint space narrowing, osteophytes, subchondral cyst formation, acetabular dysplasia, and hip capsular calcification. Results: Three female dancers experienced unilateral hip pain. One male and one female stated they had unilateral knee pain. One female experienced unilateral ankle pain. Two stated they had bilateral first MTP pain. 14 lower extremity injuries were reported to cause missed performances for these dancers. Injuries experienced included "strains," symptomatic plica, meniscal tear, ACL tear linked with meniscal tear. Range of motion examination revealed no increased range of motion in relation to the general population. No scoliosis was found in this sample of dancers. Increased femoral anteversion bilaterally was documented in two women and one man. No significant associations were found between joints showing degenerative changes and symptoms or physical findings in the dancers. Conclusions: No dancers in this population were considered hypermobile. However, the mean plantar flexion range of motion was found to be 79 degrees versus 48 degrees in the general population. Large percentage of degenerative ankle and first MTP joints were found in the individuals in this study. Prevalence of hip capsular calcification and radiographic degenerative changes in the knees, ankles, and first MTP joints was increased in dancers. But as previously mentioned this prevalence was rarely symptomatic. Overall, dancers do not state joint pain as the reason for retirement.

van Dijk CN, Lim LS, Poortman A, Strubbe EH, Marti RK. Degenerative joint disease in female ballet dancers. *Am J Sports Med.* May-Jun 1995;23(3):295-300.

Background: It is suggested that high intensity physical activity may lead to arthrosis. However, there is contradictory evidence. Ankle and first metatarsophalangeal joints are subject to microtrauma during dance. Knees, feet, hip, and ankles are also subject to abnormal stressed because of dance positions. Objectives: Evaluate a group of retired dancers and examine hip, ankle, subtalar, and first metatarsophalangeal joints for signs of arthrosis and compare to age-matched controls. Methods: Former dancers of major Dutch ballet companies between the ages of 50 and 70 were contacted. 19 female dancers and 19 age-

matched controls were utilized in this study. Examinations included range of motion and roentgenographic imaging examination. Results: The mean duration of the ballet dancers' careers was 37 years. Mean dance time was 45 hours per week. Mean age of dancers was 59 years. None of the dancers had been free of injuries during their careers. Two dancers had arthrosis of the hip and two dancers had intertrochanteric osteotomies. In terms of range of motion, dancers had increased flexion, external rotation, and abduction range of motion of the hip. No difference in ankle range of motion between dancers and control group. Increase inversion and eversion was found in dancers' subtalar range of motion. First metatarsophalangeal joint dorsiflexion range of motion was increased in dancers. For roentgenographic examination no difference was found in the hip joint. Seven subtalar joints revealed grade I arthrosis. Increased joint space width was found in the ankle and first metatarsophalangeal joint. 14 feet revealed hallux valgus in dancers and one in control group. Discussion: Increased risk of arthrosis after long ballet dance careers was found. Results were significantly different between groups for all joints except the hip joint. The cause of arthrosis is most likely the result of microtrauma. This microtrauma is a result of the extreme range of motions placed on joints and abnormal forces caused by the classical ballet positions and movements.

Vingard E. Sport and the development of osteoarthritis of the hip. *Sports Med.* Jul 1994;18(1):1-3.

Background: Hip osteoarthritis is common for individuals working in certain fields (farming and construction work). Specific work load factors that are responsible for this include heavy lifting and static postures for long periods of time. Summary: Load on different joints is increased during sports. This increases risk for trauma, however; improved neuromuscular control is developed. Football players were found to have increased osteoarthritis of the hip than non-football players. Men with increased exposure to sports had a 4.5 times larger risk for hip osteoarthritis development. Conclusions: Intense physical loading of the hip joint is experienced during sports. The risk of increase joint degeneration must be balance against benefits of exercise.

Vingard E, Alfredsson L, Malchau H. Osteoarthritis of the hip in women and its relation to physical load at work and in the home. *Ann Rheum Dis.* May 1997;56(5):293-298.

Background: The potential etiological causes of osteoarthritis of the hip are history of trauma, congenital/developmental changes, hereditary factors, and being overweight. Athletics have been associated with early development of osteoarthritis of the hip in men; especially for those men playing soccer or track. Studies on workload factors have mainly been completed in men and there are few studies focused on women. Retired

professional male and female ballet dancers from five Scandinavian companies had high prevalence of hip osteoarthritis. The high loading of the joints and increased laxity are both contributing factors to osteoarthritis in dancers. Objectives: To examine the relationship between physical workload and osteoarthritis of the hip in women. Methods: Phone or letter interviews were completed. Questions regarding health, medication, social history, occupational history, work in home, and sport were included in these interviews. 242 individuals were included in this study. The relation between physical work load and osteoarthritis was calculated utilizing odds ratio for high exposure, medium exposure, and low exposure groups. The exposure groupings were determined by number of hours of specific activity each day. Relative risks (RRs) were calculated utilizing Mantel-Haenszel, with 95% confidence interval. Results: 26% of the women had left sided, 35% had right sided, and 39% had bilateral hip arthrosis. Higher RRs were found in the high exposure group than the medium group. The highest RR was demonstrated for those exposed to high physical loads during work and sport. Discussion: There is an association between physical workload and osteoarthritis of the hip in women. For sports, the greater amount of sports played led to higher prevalence of osteoarthritis. Mechanical loads during work activity presents as a risk factor for osteoarthritis development. There was a selection bias to this study because more women who had undergone total hip replacements completed the interview.

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