



PASIG **PERFORMING ARTS**
SPECIAL INTEREST GROUP



ORTHOPAEDIC SECTION
AMERICAN PHYSICAL THERAPY ASSOCIATION



PASIG MONTHLY CITATION BLAST: No. 108

September 2015

Dear Performing Arts SIG members:

Call for 2016 PASIG committee chairs! We have several positions available. Please consider nominating yourself and a colleague in order to become more involved with the PASIG. For more information, contact Liz Chesarek: echesarek@gmail.com

The **PASIG's Nominating Committee** is currently seeking nominations for the following positions:

- **Vice President/Education Chair: 3-year term**
- **Nominating Committee Member: 3-year term.**

If you are aware of an Orthopaedic Section Member who would like to run for PASIG office, please submit their name to our [Nominating Committee](#). Additionally, feel free to self-nominate yourself if YOU are interested in running!

A **PASIG student scholarship** is available for performing arts poster and platform presentations at CSM 2016! Contact Anna Saunders, PASIG student scholarship chair, with your abstract: annarosemary@gmail.com

Call for case reports: If you have a brief, clinically-focused case report on a performing arts PT patient, or a clinical commentary, please contact Annette Karim to submit your writing for the next Orthopaedic Physical Therapy Practice Magazine: neoluvsonlyme@aol.com

Tweet Tweet! We have a Twitter page!

<https://twitter.com/PT4Performers>

Post your articles and info on your site, let's get connected!

Check out the Orthopaedic section Facebook page, where you can find and post PASIG info: <https://www.facebook.com/pages/APTA-Orthopaedic-Section/121020534595362>

Below is a list of the PASIG leadership. Please consult this list regarding contact info:

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WE NEED MORE CONTRIBUTORS TO OUR MONTHLY CITATION BLASTS!!!!

Past Monthly citation blasts are available, with citations and EndNote file, listed on the website:

http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes

TOPICS THAT HAVE BEEN COVERED RECENTLY INCLUDE:

Neural Entrapments Found Among Musicians

Stress fractures of the foot and ankle

Dry needling

Dynamic Warm Up and Stretching

Platelet Rich Plasma Injections

Back Pain in Dancers

Hallux Valgus in Dancers

Posterior ankle impingement

TMD in Musicians

Concussions

Bone Mineral Density in Dancers

If you are interested in contributing by writing a citation blast, contact me, Brooke Winder: BrookeRwinder@gmail.com

Best regards,

Brooke

Brooke Winder, PT, DPT, OCS

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PERFORMING ARTS CONTINUING EDUCATION, CONFERENCES, AND RESOURCES

Musician Health Series, Janice Ying, PT, DPT, OCS

Glendale Adventist Therapy and Wellness Center, Los Angeles area (Eagle Rock), CA

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

Healthy Musician Series - Overuse

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-American Physical Therapy Association,

Performing Arts SIG

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)

Patellofemoral Pain and Dance

Patellofemoral pain is not uncommon in the dance population. The demand for hip and lower extremity external rotation in many forms of dance, and the repetitive flexion loading required for plies, jumps, and other common dance movements can place the patellofemoral joint under compressive and shear stresses. This month's blast highlights very recent articles discussing proximal hip control and strength, kinematics/biomechanics, and treatment interventions for patellofemoral pain. Much of this research may confirm what many of us already do clinically for our patients, but it is still a great refresher. As we often find, specific studies on dancers themselves are few but we may still apply the below studies to our population. I hope you find this collection of abstracts helpful in your practice!

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Almeida, Gabriel Peixoto Leão, et al. "Does anterior knee pain severity and function relate to the frontal plane projection angle and trunk and hip strength in women with patellofemoral pain?." *Journal of Bodywork and Movement Therapies* (2015).

The aim of the present study was to determine the relationship between knee pain severity and function with the frontal plane projection angle (FPPA) and trunk and hip peak torque (PT) in women with patellofemoral pain (PFPS). Twenty-two women with PFPS were assessed. Knee pain severity (KPS) was assessed with an 11-point visual analog scale and function with an Anterior Knee Pain Scale. The FPPA was recorded with a digital camera. PT of extensors, abductors, and the lateral rotators of hip and lateral core stability were measured with a handheld dynamometer. FPPA was the only predictor for the KPS. Regarding predictors of function, PT of lateral core stability and the extensor and abductor of the hip explained 41.4% of the function. Increase in FPPA was associated with greater KPS, and the lowest PT of lateral core stability, hip abductors, and extensors was associated with lower function in women with PFPS.

de Marche Baldon, Rodrigo, et al. "Evaluating Eccentric Hip Torque and Trunk Endurance as Mediators of Changes in Lower Limb and Trunk Kinematics in Response to Functional Stabilization Training in Women With Patellofemoral Pain." *The American journal of sports medicine* (2015): 0363546515574690.

Background: Altered movement patterns of the trunk and lower limbs have been associated with patellofemoral pain (PFP). It has been assumed that increasing the strength of the hip and trunk muscles would improve lower limb and trunk kinematics in these patients. However, evidence in support of that assumption is limited.

Purpose: To determine whether increases in the strength of hip muscles and endurance of trunk muscles in response to functional stabilization training will mediate changes in frontal plane lower limb kinematics in patients with PFP.

Study Design: Controlled laboratory study.

Methods: Thirty-one female athletes were randomized to either a functional stabilization training group that emphasized strengthening of the trunk and hip muscles or a standard training group that emphasized stretching and quadriceps strengthening. Patients attended a baseline assessment session, followed by 8 weeks of intervention, and were then reassessed at the end of the intervention period. The potential mediators that were evaluated included eccentric torque of hip muscles and endurance of the trunk muscles. The outcome variables were the lower limb and trunk kinematics in the frontal plane assessed during a single-legged squat task.

Results: The eccentric strength of the gluteus muscles showed a mediation effect ranging from 18% to 32% on changes to frontal plane kinematics (decreased ipsilateral trunk inclination, pelvis contralateral depression, and hip adduction excursions) observed in the functional stabilization training group after intervention.

Conclusion: Although the mediation effects were small, the results suggest that improvements in the strength of the gluteus muscles can influence the frontal plane movement patterns of the lower limb and trunk in women with PFP.

Clinical Relevance: Patients with PFP might benefit from strengthening of the hip muscles to improve frontal plane lower limb and trunk kinematics during functional tasks.

Dorey, Christopher, and Jonathan Mark Williams. "Strengthening the hip muscles in individuals with patellofemoral pain: what can be learned from the literature?." *Physical Therapy Reviews* 20.2 (2015): 63-72.

Background: The precise aetiology of Patellofemoral Pain Syndrome (PFPS) remains unclear; however, the efficacy of employing hip abductor and lateral rotator muscle strengthening interventions in the rehabilitation of patients with PFPS has been previously documented. Despite this it remains unclear as to the most efficacious protocol to optimise outcome.

Objectives: To synthesise the literature regarding different hip strengthening protocols and their effect on decreasing pain and increasing hip strength in individuals with PFPS.

Methods: A systematic search of Medline, Google Scholar, SPORTDiscuss, Science Citation Index, OALster, CINAHL, Academic Search Complete, Science Direct, Scopus was completed in October 2013. Critical appraisal was completed using multiple tools depending on study design.

Results: Five articles satisfied the inclusion criteria. Overall articles scored highly on critical appraisal and positive effects of proximal strengthening were identified as was a reduction in pain in individuals with PFPS. No correlation was established between change in strength of hip lateral rotators or hip abductors and change in pain ($R_s^2 = 0.003$; $R_c^2 = 0.010$). A programme incorporating open and closed chain exercises was more effective than open chain alone for decreasing pain. Higher frequency and longer duration of exercise was identified as resulting in greater reduction of pain. The frequency required may be linked to participant's strength before intervention.

Conclusions: Hip strengthening results in significant gains in strength and reductions in pain in individuals with PFPS. Exercise protocols incorporating open and closed kinetic chain, with high frequency and long duration seem to be important in optimising their effect on pain and strength

Ferber, Reed, et al. "Strengthening of the Hip and Core Versus Knee Muscles for the Treatment of Patellofemoral Pain: A Multicenter Randomized Controlled Trial." *Journal of athletic training* 50.4 (2015): 366-377.

Objective: To compare PFP pain, function, hip- and knee-muscle strength, and core endurance between KNEE and HIP protocols after 6 weeks of rehabilitation. We hypothesized greater improvements in (1) pain and function, (2) hip strength and core endurance for patients with PFP involved in the HIP protocol, and (3) knee strength for patients involved in the KNEE protocol.

Design: Randomized controlled clinical trial.

Setting: Four clinical research laboratories in Calgary, Alberta; Chicago, Illinois; Milwaukee, Wisconsin; and Augusta, Georgia.

Patients or Other Participants: Of 721 patients with PFP screened, 199 (27.6%) met the inclusion criteria (66 men [31.2%], 133 women [66.8%], age = 29.0 ± 7.1 years, height = 170.4 ± 9.4 cm, weight = 67.6 ± 13.5 kg).

Intervention(s): Patients with PFP were randomly assigned to a 6-week KNEE or HIP protocol.

Main Outcome Measure(s): Primary variables were self-reported visual analog scale and Anterior Knee Pain Scale measures, which were conducted weekly. Secondary variables were muscle strength and core endurance measured at baseline and at 6 weeks.

Results: Compared with baseline, both the visual analog scale and the Anterior Knee Pain Scale improved for patients with PFP in both the HIP and KNEE

protocols ($P < .001$), but the visual analog scale scores for those in the HIP protocol were reduced 1 week earlier than in the KNEE group. Both groups increased in strength ($P < .001$), but those in the HIP protocol gained more in hip-abductor ($P = .01$) and -extensor ($P = .01$) strength and posterior core endurance ($P = .05$) compared with the KNEE group.

Conclusions: Both the HIP and KNEE rehabilitation protocols produced improvements in PFP, function, and strength over 6 weeks. Although outcomes were similar, the HIP protocol resulted in earlier resolution of pain and greater overall gains in strength compared with the KNEE protocol.

Hendry, D., et al. "Effect of Mulligan's and Kinesio knee taping on adolescent ballet dancers knee and hip biomechanics during landing." *Scandinavian Journal of Medicine & Science in Sports* (2014).

Taping is often used to manage the high rate of knee injuries in ballet dancers; however, little is known about the effect of taping on lower-limb biomechanics during ballet landings in the turnout position. This study investigated the effects of Kinesiotape (KT), Mulligan's tape (MT) and no tape (NT) on knee and hip kinetics during landing in three turnout positions. The effect of taping on the esthetic execution of ballet jumps was also assessed. Eighteen pain-free 12–15-year-old female ballet dancers performed ballet jumps in three turnout positions, under the three knee taping conditions. A Vicon Motion Analysis system (Vicon Oxford, Oxford, UK) and Advanced Mechanical Technology, Inc. (Watertown, Massachusetts, USA) force plate collected lower-limb mechanics. The results demonstrated that MT significantly reduced peak posterior knee shear forces ($P=0.025$) and peak posterior ($P=0.005$), medial ($P=0.022$) and lateral ($P=0.014$) hip shear forces compared with NT when landing in first position. KT had no effect on knee or hip forces. No significant differences existed between taping conditions in all landing positions for the esthetic measures. MT was able to reduce knee and the hip forces without affecting the esthetic performance of ballet jumps, which may have implications for preventing and managing knee injuries in ballet dancers.

Kooiker, Laura, et al. "Effects of Physical Therapist–Guided Quadriceps-Strengthening Exercises for the Treatment of Patellofemoral Pain Syndrome: A Systematic Review." *Journal of Orthopaedic & Sports Physical Therapy* 44.6 (2014): 391-B1.

Study Design Systematic literature review.

Objective To summarize the evidence for physical therapist–guided quadriceps-strengthening exercises as a treatment for patellofemoral pain syndrome.

Background Although quadriceps strengthening is often included in the plan of care for patellofemoral pain syndrome, a systematic review published in 2003 found only limited evidence that exercise was more effective than no exercise for this common condition.

Methods The PubMed, Embase/MEDLINE, and Cochrane Central Register of Controlled Trials databases, from inception to January 9, 2014, were searched for randomized controlled trials comparing the use of quadriceps-strengthening exercises to interventions consisting of advice/information or a placebo. Outcomes of interest were pain measures and function, as measured with self-report questionnaires. The methodological quality of the randomized controlled trials was assessed with the Physiotherapy Evidence Database scale. Results were summarized using a best-evidence synthesis and graphically illustrated using forest plots without meta-analysis.

Results Seven studies were included in the literature review. These studies reported strong evidence that isolated quadriceps strengthening is more effective in reducing pain and improving function than advice and information alone. In addition, compared to advice and information or placebo, there was strong evidence that quadriceps-strengthening exercises combined with other interventions may be more effective in reducing pain immediately postintervention and after 12 months, but not in improving function.

Conclusion The literature provides strong evidence for the use of quadriceps-strengthening exercises, with or without other interventions, for the treatment of patellofemoral pain syndrome.

Lack, Simon, et al. "Proximal muscle rehabilitation is effective for patellofemoral pain: a systematic review with meta-analysis." *British journal of sports medicine*(2015): bjsports-2015.

Background Proximal muscle rehabilitation is commonly prescribed to address muscle strength and function deficits in individuals with patellofemoral pain (PFP). This review (1) evaluates the efficacy of proximal musculature rehabilitation for patients with PFP; (2) compares the efficacy of various rehabilitation protocols; and (3) identifies potential biomechanical mechanisms of effect in order to optimise outcomes from proximal rehabilitation in this problematic patient group.

Methods Web of Knowledge, CINAHL, EMBASE and Medline databases were searched in December 2014 for randomised clinical trials and cohort studies evaluating proximal rehabilitation for PFP. Quality assessment was performed by two independent reviewers. Effect size calculations using standard mean differences and 95% CIs were calculated for each comparison.

Results 14 studies were identified, seven of high quality. Strong evidence indicated proximal combined with quadriceps rehabilitation decreased pain and improved function in the short term, with moderate evidence for medium-term outcomes. Moderate evidence indicated that proximal when compared with quadriceps rehabilitation decreased pain in the short-term and medium-term, and improved function in the medium term. Limited evidence indicated proximal combined with quadriceps rehabilitation decreased pain more than quadriceps rehabilitation in the long term. Very limited short-term mechanistic evidence indicated proximal rehabilitation compared with no intervention decreased pain,

improved function, increased isometric hip strength and decreased knee valgum variability while running.

Conclusions A robust body of work shows proximal rehabilitation for PFP should be included in conservative management. Importantly, greater pain reduction and improved function at 1 year highlight the long-term value of proximal combined with quadriceps rehabilitation for PFP.

Lankhorst, Nienke E., et al. "Can We Predict Which Patients With Patellofemoral Pain Are More Likely to Benefit From Exercise Therapy? A Secondary Exploratory Analysis of a Randomized Controlled Trial." *Journal of orthopaedic & sports physical therapy* 45.3 (2015): 183-189.

Study Design Secondary exploratory analysis of a randomized controlled trial comparing supervised exercise therapy to usual care in patients with patellofemoral pain (PFP).

Objective To explore which patients with PFP are more likely to benefit from exercise therapy.

Background Patellofemoral pain is a common condition for which exercise therapy is effective in reducing pain and improving function. However, not all patients benefit from exercise therapy.

Methods The present study explored patient characteristics that might interact with treatment effects of PFP in 131 patients treated with usual care or exercise therapy. These characteristics were tested for interaction with treatment in a regression analysis. The primary outcomes were function and pain on activity at a 3-month follow-up.

Results None of the tested variables had a significant interaction with treatment. A positive trend was seen for females with PFP: they were more likely to report higher function scores with exercise therapy than with usual care compared to males with PFP ($\beta = 12.1$; 95% confidence interval: 0.23, 24.0; $P = .05$). A positive trend was seen for patients with a longer duration of complaints (greater than 6 months); they were more likely to report higher function scores and to have less pain on activity with exercise therapy than with usual care compared to those with a shorter duration of complaints ($\beta = 12.3$; 95% confidence interval: -0.08, 24.7; $P = .05$ and $\beta = -1.74$; 95% confidence interval: -3.90, 0.43; $P = .12$, respectively).

Conclusion Two factors, sex and duration of complaints, may have a predictive value for response to exercise therapy at 3-month follow-up. Due to the exploratory design of the study, future research should confirm this tendency.

Liao, Tzu-Chieh, et al. "Femur Rotation Increases Patella Cartilage Stress in Females with Patellofemoral Pain." *Medicine and science in sports and exercise* (2015).

PURPOSE: This study aimed to test the hypothesis that internal rotation of the femur increases patellofemoral joint stress in persons with patellofemoral pain (PFP).

METHODS: Patella cartilage stress profiles of nine female participants with PFP were obtained during squatting using subject-specific finite element (FE) models of the patellofemoral joint (15° and 45° of knee flexion). Input parameters for the FE model included joint geometry, quadriceps muscle forces during squatting, and weight-bearing patellofemoral joint kinematics. The femur of each model was then internally rotated 5° and 10° along its long axis beyond that of the natural degree of rotation. Using a nonlinear FE solver, quasistatic loading simulations were performed to quantify patellofemoral joint stress.

RESULTS: Compared with those at the natural position of the femur, mean hydrostatic pressure and mean octahedral shear stress were significantly higher when the femur was internally rotated 5° and 10°. No significant differences in stress variables were observed when the femur was rotated from 5° to 10°. These findings were consistent across both knee flexion angles (15° and 45°).

CONCLUSIONS: The finding of elevated hydrostatic pressure and octahedral shear stress with internal rotation of the femur supports the premise that females with PFP who exhibit abnormal hip kinematics may be exposed to elevated patellofemoral joint stress.

Nakagawa, Theresa Helissa, Carlos Dias Maciel, and Fábio Viadanna Serrão. "Trunk biomechanics and its association with hip and knee kinematics in patients with and without patellofemoral pain." *Manual therapy* 20.1 (2015): 189-193.

Patellofemoral pain (PFP) is a common lower extremity condition observed in sports clinics. Recently, it has been suggested that trunk motion could affect hip and knee biomechanics in the frontal plane. Thus, the purpose of the study was compare trunk kinematics, strength and muscle activation between people with PFP and healthy participants. In addition, the associations among trunk biomechanics, hip and knee kinematics were analysed. Thirty people with PFP and thirty pain-free individuals participated. The peak ipsilateral trunk lean, hip adduction, and knee abduction were evaluated with an electromagnetic tracking system, and the surface electromyographic signals of the iliocostalis and external oblique muscle were recorded during single-leg squats. Trunk extension and trunk flexion with rotation isometric strength and side bridge tests were quantified using a handheld dynamometer. Compared with the control group, the PFP group demonstrated increased ipsilateral trunk lean, hip adduction and knee abduction ($p = 0.02-0.04$) during single-leg squat accompanied with decreased trunk isometric strength ($p = < 0.001-0.009$). There was no between-group difference in trunk muscle activation. Only in the control group, ipsilateral trunk lean was significantly correlated with hip adduction ($r = -0.66$) and knee abduction ($r = 0.49$); also, the side bridge test correlated with knee abduction ($r = -0.51$). Differences in

trunk, hip and knee biomechanics were found in people with PFP. No relationship among trunk, hip and knee biomechanics was found in the PFP group, suggesting that people with PFP show different movement patterns compared to the control group.

Peng, H. T., et al. "Influences of Patellofemoral Pain and Fatigue in Female Dancers during Ballet Jump-Landing." *International journal of sports medicine*(2015).

This study investigated the influence of patellofemoral pain ([PFP](#)) and fatigue on lower-extremity joint biomechanics in female dancers during consecutive simple ground échappé. 3-dimensional joint mechanics were analyzed from the no-fatigue to fatigue conditions. 2-way mixed ANOVAs were used to compare the differences of the kinematic and kinetic variables between groups and conditions. Group main effects were seen in increased jump height ($p=0.03$), peak vertical ground reaction force ($p=0.01$), knee joint power absorption ($p=0.04$), and patellofemoral joint stress (PFJS, $p=0.04$) for [PFP](#) group. Fatigue main effects were found for decreased jump height ($p<0.01$), decreased ankle plantarflexion at initial foot-ground contact ($p=0.01$), and decreased ankle displacement ($p<0.01$). Hip external rotation [impulse](#) and hip joint stiffness increased (both $p<0.01$) while knee extension and external rotation moment, and ankle joint power absorption decreased ($p<0.01$, $p=0.02$, $p<0.01$, respectively) after fatigue. The peak PFJS also decreased after fatigue ($p<0.01$). Female ballet dancers with [PFP](#) sustained great ground impact and loads on the knee probably due to higher jump height compared to the controls. All dancers presented diminished knee joint loading for the protective mechanism and endurance of ankle joint musculature required for the dissipation of loads and displayed a distal-to-proximal dissipation strategy after fatigue.

Ramskov, Daniel, et al. "High eccentric hip abduction strength reduces the risk of developing patellofemoral pain among novice runners initiating a self-structured running program: a 1-year observational study." *journal of orthopaedic & sports physical therapy* 45.3 (2015): 153-161.

Study Design Observational prospective cohort study with 1-year follow-up.

Objectives To investigate the relationship between eccentric hip abduction strength and the development of patellofemoral pain (PFP) in novice runners during a self-structured running regime.

Background Recent research indicates that gluteal muscle weakness exists in individuals with PFP. However, current prospective research has been limited to the evaluation of isometric strength, producing inconsistent findings. Considering that hip muscles, including the gluteus maximus and medius, activate eccentrically to control hip and pelvic motion during weight-bearing activities such as running, the potential link between eccentric strength and PFP risk should be evaluated.

Methods Eight hundred thirty-two novice runners were included at baseline, and 629 participants were included in the final analysis. Maximal eccentric hip abduction strength was measured using a handheld dynamometer prior to initiating a self-structured running program. The diagnostic criteria to classify knee pain as PFP were based on a thorough clinical examination. Participants were followed for 12 months and training characteristics were gathered with a global positioning system.

Results Results from the unadjusted generalized linear regression model for cumulative risk at 25 and 50 km indicated differences in cumulative risk of PFP between high strength, normal strength, and low strength ($P < .05$), with higher strength associated with reduced risk.

Conclusion Findings from this study indicate that, among novice runners, a level of peak eccentric hip abduction strength that is higher than normal may reduce the risk of PFP during the first 50 km of a self-structured running program.

Willson, John D., Eric D. Ellis, and Thomas W. Kernozek. "Plantar Loading Characteristics During Walking in Females With and Without Patellofemoral Pain." *Journal of the American Podiatric Medical Association* 105.1 (2015): 1-7.

Background: Patellofemoral pain (PFP) is a common injury, particularly in females. Foot pronation may promote knee and hip transverse plane joint kinematics during gait thought to contribute to PFP. Greater knowledge of plantar loading characteristics in females with PFP may be valuable to provide a basis for clinical decisions regarding footwear and foot orthoses. The purpose of this study was to compare plantar loading distribution in females with and without PFP during gait.

Methods: Plantar pressure during walking was recorded from 19 females with PFP and 20 females without PFP. Contact area, peak force, and force-time integral were evaluated in ten plantar areas. Arch index was also calculated from contact area data during gait.

Results: Contact area in females with PFP was 9% smaller in the first metatarsal region ($P = .039$) and 20% smaller in the midfoot region ($P = .042$) than in females without PFP. Peak force was 31% lower in the midfoot region for females with PFP ($P = .027$) and 13% lower in the first metatarsal region ($P = .064$). Force-time integral was 18% lower in the first metatarsal region in females with PFP ($P = .024$). Females with PFP demonstrated a lower arch index (suggesting a higher arch) ($P = .028$).

Conclusions: Decreased medial forefoot loading and decreased midfoot contact suggest decreased foot pronation during gait in females with PFP relative to females without PFP. Decreased foot pronation may foster increased patellofemoral joint loading rates. These data contribute to rationale for footwear modifications to modify plantar loading characteristics in people experiencing PFP.

