

# Foot & Ankle Research Review™

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Issue 34 – 2017

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### Abbreviations used in this issue:

**BMI** = body mass index  
**CAI** = chronic ankle instability  
**NNT** = number needed to treat  
**OA** = osteoarthritis  
**OR** = odds ratio  
**PRISMA** = Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols  
**PRP** = platelet-rich plasma  
**WBLT** = weight-bearing lunge test

## Welcome to Issue 34 of Foot and Ankle Research Review.

The body of evidence surrounding knee OA is ever increasing and the article by Pearson et al., highlights the potential role foot and ankle symptoms play in the progression of knee OA. It has also been interesting reading around the developing evidence for the use of platelet-rich plasma (PRP) therapy in lower limb pathologies, the article by Acosta-Olivo et al., examines the use of PRP in plantar fasciitis. I have also included an interesting qualitative study that examines footwear needs of people in a standing environment – some interesting themes were uncovered by the research. This issue concludes with a systematic review that investigated how flat the paediatric foot should be.

I hope you enjoy this issue and please keep the feedback coming in.

Kind regards,

**Dr Matthew Carroll**

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## Longitudinal association between foot and ankle symptoms and worsening of symptomatic radiographic knee osteoarthritis: data from the osteoarthritis initiative

**Authors:** Paterson KL et al.

**Summary:** Data on foot and/or ankle symptoms at baseline and over 4 years were recorded in 1368 Osteoarthritis Initiative participants with symptomatic radiographic knee OA, to determine whether these symptoms were associated with worsening knee pain and radiographic changes. Foot and/or ankle symptoms identified in either foot at baseline increased the risk of worsening knee pain (adjusted OR [aOR] 1.54; 95% CI 1.25-1.91). Laterality analysis indicated that worsening knee pain was associated with ipsilateral (aOR 1.50; 95% CI 1.07-2.10), contralateral (aOR 1.44; 95% CI 1.02-2.06) and bilateral foot and/or ankle symptoms (OR 1.61; 95% CI 1.22-2.13), but there was no association between symptoms and worsening symptomatic radiographic knee OA.

**Comment:** Establishing knowledge of risk factors in those with knee OA is important to understand why the disease progresses in some individuals but not others. To date, the strongest known modifiable risk factors for worsening of knee pain in people with knee OA are a higher BMI and infrapatellar fat pad or intercondylar synovitis. Although concurrent symptoms at the foot, ankle and knee occur more often than any other multi-joint pain presentation there is minimal high quality research in this area in relation to knee OA. The main findings of this project are very relevant for the clinician. Patients with knee OA who also had foot/ankle pain were more likely to experience clinically relevant worsening of their knee pain at some time in the subsequent 4 years. The authors explain this finding may be due to foot pronation, internal tibial rotation, increasing knee adduction moment, footwear and/or the existence of epiphenomenon due to an unmeasured shared risk factor such as fibromyalgia, pain catastrophising, a multi-joint pain phenotype or generalised form of OA.

**Reference:** *Osteoarthritis Cartilage* 2017;25(9):1407-13

[Abstract](#)

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## Medial shoe-ground pressure and specific running injuries: A 1-year prospective cohort study

**Authors:** Brund RBK et al.

**Summary:** This prospective cohort study in 79 recreational male runners assessed whether running distance until the first APM-injury (Achilles tendinitis, plantar fasciopathy, medial tibial stress syndrome) was determined by foot balance (average medial pressure divided by average lateral pressure) during the stance phase. The proportion of APM-injuries was greater in those with a higher medial-shod pressure ( $n = 99$ ) than those with a higher lateral-shod pressure ( $n = 59$ ) based on a time-to-event model after 1500 km of running; the cumulative risk difference was 16% (95% CI 3-28;  $p = 0.011$ ).

**Comment:** An interesting study that sparks debate over the controversial relationship between foot pronation and lower limb injury. Epidemiological studies reveal contradictory results surrounding the relationship between pronation and lower limb injury, but anecdotally many clinical treatment modalities are used to address foot pronation and lower limb injury. Whilst it is easy to criticise studies that investigate this relationship, the authors do acknowledge they could not account for previous injury history, footwear use or running history. Of interest, the shoes used in this study were a standardised neutral shoe, the clinical reality is that footwear is now specifically fitted to the individual's needs, beliefs and activity. The fitting of footwear specific to the participants foot function may well have altered the study results with regard to foot pressures.

**Reference:** *J Sci Med Sport* 2017;20(9):830-34

[Abstract](#)



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## Effect of taping on multi-segmental foot kinematic patterns during walking in persons with chronic ankle instability

**Authors:** Dingenen B et al.

**Summary:** This cross-sectional study examined multi-segmental foot kinematic patterns in 15 patients with chronic ankle instability (CAI) and 12 non-injured controls during walking, and assessed the use of high- and low-Dye taping. CAI patients had less ankle dorsiflexion during loading response ( $p = 0.025$ ) and a more inverted calcaneus relative to the shank during the initial swing phase ( $p = 0.024$ ) than controls. After low-Dye taping, the metatarsus position was more inverted in relation to the midfoot during almost the entire stance phase ( $p = 0.017$ ). High-Dye taping had no effect on kinematic patterns.

**Comment:** This research raises some very important concepts for the clinician to consider. First, in participants with CAI, the application of low Dye taping placed the foot in a theoretically more at-risk position. Does this indicate low Dye taping should not be used in people with CAI? Second, neither taping condition significantly altered the inverted position of the calcaneus. The ineffectiveness of foot and ankle taping may imply that other or complementary mechanisms (proprioceptive, neuromuscular, psychological or placebo) might also be important to explain the injury-reduction effect of ankle taping.

**Reference:** *J Sci Med Sport* 2017;20(9):835-40

[Abstract](#)

## Validity of clinical outcome measures to evaluate ankle range of motion during the weight-bearing lunge test

**Authors:** Hall EA and Docherty CL

**Summary:** This cross-sectional study was conducted to assess the concurrent validity of standard clinical outcome measures (dorsiflexion angle with digital inclinometer 15 cm distal to the tibial tuberosity or at the tibial tuberosity, maximum lunge distance) and laboratory outcome measures (dorsiflexion angle using a 2D motion capture system) during the weight-bearing lunge test (WBLT; touching a vertical line on the wall with the knee while maintaining heel contact with the ground) to determine dorsiflexion range of motion. Each measurement technique and the reference standard were highly correlated. The correlation between the inclinometer angle below the tibial tuberosity ( $44.9^\circ$ ) and motion capture angle ( $27.0^\circ$ ) was  $r = 0.76$  ( $p = 0.001$ ), between the inclinometer angle at the tibial tuberosity ( $39.0^\circ$ ) and the motion capture angle was  $r = 0.71$  ( $p = 0.001$ ), and between the distance from the wall (10.3 cm) and the motion capture angle was  $r = 0.74$  ( $p = 0.001$ ).

**Comment:** The WBLT is commonly used in clinical practice to assess ankle range of motion. The study compared four techniques of measuring the WBLT: digital inclinometer at the tibial tuberosity, digital inclinometer placed 15 cm distal to the tibial tuberosity, a tape measure, and a two-dimensional video camera. Results showed that both inclinometer angles and the maximum lunge distance have a high correlation with the motion capture angle, indicating that maximum lunge distance and inclinometer angles are valid clinical measures during the WBLT. This is good evidence to continue the use of this test as a clinical screening tool. The techniques are easy to apply, inexpensive and readily available in the clinical setting.

**Reference:** *J Sci Med Sport*. 2017;20(7):618-21

[Abstract](#)

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### Independent commentary by Dr Matthew Carroll

Matthew graduated in podiatry at the CIT in Wellington. He undertook his postgraduate work at Otago University, Dunedin, New Zealand, Curtin University, Western Australia and Auckland University of Technology, Auckland, New Zealand. He is Head of Postgraduate Programmes within the School of Clinical Sciences and Senior Lecturer at Auckland University of Technology. Matthew is Associate Editor for BMC Musculoskeletal Disorders and an Editorial Board Member for the Journal of Foot and Ankle Research. He is active in research with a special interest in musculoskeletal conditions affecting the lower limb.



## Plantar fasciitis. A comparison of treatment with intralesional steroids versus platelet-rich plasma (PRP). A randomized, blinded study

**Authors:** Acosta-Olivo C et al.

**Summary:** A controlled, randomised, blinded clinical assay compared intralesional steroids (dexamethasone 8 mg plus lidocaine 2 mL; n = 12) versus platelet-rich plasma (PRP; plasma 3 mL activated with 10% calcium gluconate 0.45 mL; n = 12) as treatments for plantar fasciitis in patients not responding to conservative treatment. Visual Analog Scale, Foot and Ankle Disability Index and American Orthopedic Foot and Ankle Society scale assessments at 2, 4, 8, 12, and 16 weeks post-treatment revealed no differences between treatments.

**Comment:** The authors provide a nice overview of PRP therapy in the introduction. Whilst the study demonstrated improvement in pain levels in both treatment groups and no differences between the two treatment types, the applicability of the results is limited by the small sample size and short follow-up period. This is in line with the growing body of evidence for the use of PRP therapy in the treatment of plantar fasciitis, previous research has only demonstrated benefits in small populations and investigated effects over a relatively short follow-up period. This is an exciting area for research and it will be very interesting to see the results of long-term research.

**Reference:** *J Am Podiatr Med Assoc.* 2016; Oct 11 [Epub ahead of print]

[Abstract](#)

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## Calf muscle strain injuries in sport: a systematic review of risk factors for injury

**Authors:** Green B and Pizzari T

**Summary:** This systematic review examined published literature on intrinsic or extrinsic risk factors for calf strain injury. In total, 10 studies were identified across sports including football, Australian football, rugby union, basketball and triathlon, and included data on 5397 athletes and 518 injuries. Best evidence synthesis suggested that chronological age and previous calf strain injury were the strongest risk factors for future calf muscle injury, while previous lower limb injuries (hamstring, quadriceps, adductor, knee) had limited evidence of increased risk. Height, weight, gender and side dominance had no evidence supporting increased risk.

**Comment:** This well constructed review provides a great best-evidence synthesis on calf injury. Although not surprising, the review found increasing age and previous injury to be the most predictive factors for injury. These two unmodifiable factors have also been implicated as a risk for further injury for other leg strains such as the hamstrings and groin. The review also posits some thoughtful considerations surrounding future research namely the role of increasing eccentric strength and cross-sectional moment of inertia. Recent work related to hamstring strain has identified an important association between greater levels of eccentric strength and increasing fascicle lengths as able to ameliorate risk of non-modifiable risk factors of age and previous injury history.

**Reference:** *Br J Sports Med.* 2017;51(16):1189-94

[Abstract](#)

## An explorative qualitative study to determine the footwear needs of workers in standing environments

**Authors:** Anderson J et al.

**Summary:** Semi-structured interviews conducted with people in demanding work environments that require long periods of standing, explored footwear needs in relation to musculoskeletal disorders, symptoms, comfort and design. The interviews suggested a very high percentage of musculoskeletal disorders, both day-to-day discomfort and chronic problems. Work footwear designed for standing environments must address the functionality of the shoe for the environment, the sensations and symptoms of the workers, and the influence of decision makers in encouraging footwear choices. Correct footwear and increased education regarding foot health and footwear choice could help reduce or improve musculoskeletal disorders identified in jobs that require prolonged standing.

**Comment:** This study provides insight into the needs of workers who stand for prolonged periods. Three major themes around the footwear needs of prolonged standers were uncovered, (1) wearer sensations and symptoms, (2) factors that influence footwear choice and (3) shoe functionality and environmental suitability. The study highlights many of the core concepts of footwear education and highlights the individual perception of what is an ideal shoe. There is some very interesting reading around how the participants define factors such as fit, cushioning, comfort, support and style. If you have an interest in footwear and concepts that patients have when selecting footwear then this article is well worth a read.

**Reference:** *J Foot and Ankle Res.* 2017;10:41

[Abstract](#)



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## Foot exercises and foot orthoses are more effective than knee focused exercises in individuals with patellofemoral pain

**Authors:** Mølgaard CM et al.

**Summary:** Forty adults (28 women, 12 men) screened for excessive calcaneal eversion received knee-targeted (3 times per week for 12-weeks) exercise or knee- and foot-targeted (2 times per week for 12 weeks) exercise and orthoses to alleviate patellofemoral pain. The combination of knee- and foot-targeted exercises and foot orthoses engendered a greater improvement (8.9 points; 95% CI 0.4-17.4; NNT 3; 95% CI 2-16) than knee-targeted exercise alone in Knee Injury and Osteoarthritis Outcome Score pain at 4 months.

**Comment:** This study provides evidence advocating for the use of foot orthoses combined with foot strengthening and knee exercises in the management of patellofemoral pain. When reading studies of this nature it is important to note how foot posture was quantified i.e., how was the degree of foot motion quantified, what type of foot orthotic device was manufactured for the foot and what exercises were prescribed. In this study, foot posture was quantified by static measures, foot orthoses were made from ethyl vinyl acetate with the goal being to place the foot in a neutral position and strength exercises targeted the invertors and plantarflexors of the foot and ankle. While this study replicates a common treatment approach that is used clinically, I feel research needs to move forward in this area. Specifically, to determine the subtypes of presentations of patellofemoral pain and guidance as to what combination of therapy should be used based on lower limb strength and biomechanical alignment.

**Reference:** *J Sci Med Sport.* 2017;pii: S1440-2440(17)30445-0  
[Abstract](#)

## Sonographic findings of chondral avulsion fractures of the lateral ankle ligaments in children

**Authors:** Maeda M et al.

**Summary:** This case series examined stress sonographic recordings (during manual anterior drawer stress procedure) of the ankle of chondral avulsion fractures concomitant with lateral ankle ligament injury in nine skeletally immature children. Conventional sonography revealed absence of a fracture with hyperechoic spots (sonographic occult fracture type), cortical discontinuity with hyperechoic spots (cortical disruption fracture type), fracture line in cortical bone (double-line fracture type), and a step-off deformity of cortical bone with cartilage (displaced fracture type). Stress sonography revealed abnormal motion of the chondral lesions and mobility/fluidity of hyperechoic spots along the chondral fracture site.

**Comment:** Although this study only examined nine patients with post ankle ligament injury the findings highlight that the use of stress ultrasound should be a consideration in paediatric patients after lateral ankle injury, where chondral damage is suspected. The authors propose that the use of stress sonography should be considered if hypoechoic spots are present in the cartilage of the distal fibula after ankle injury. The use of sonography to aid diagnosis is further supported due to difficulty of radiography to diagnose avulsion fractures due to the superimposition of other bony structures.

**Reference:** *J Ultrasound Med.* 2017 Feb;36(2):421-432  
[Abstract](#)

## The typically developing paediatric foot: how flat should it be? A systematic review

**Authors:** Uden H et al.

**Summary:** This systematic review, conducted according to the PRISMA protocol, aimed to define postural characteristics of the 'typically' developing paediatric foot based on 34 epidemiological papers. Sixteen different foot-posture assessments were identified with footprint-based measures as the most reported outcome. The term 'normal' in relation to foot posture is misleading in the paediatric foot, as a flat foot posture is normal at specific ages. Foot posture in developing children is age dependent and changes over time. No firm conclusion was reached about when foot posture of children ceases to develop, as no two foot measures were comparable.

**Comment:** This well developed review sought to determine the postural characteristics of the paediatric foot across ages and review the measures that have been used to quantify foot posture. The review will provide you with a great summary of all the measures that have been used to describe/quantify paediatric foot posture. Perhaps not surprising one of the major findings of the review surrounds the use of the term normal. The term 'normal' does indeed create complications and confusion when describing paediatric foot position, as flat foot is indeed a normal finding at certain ages. The second conclusion of the study that foot posture is age dependent and changes over time is an even more challenging concept for the clinician to work through, particularly if the parents of the paediatric patients attribute their lower limb symptomology to an untreated flat foot when they were young.

**Reference:** *J Foot Ankle Res.* 2017;10:37  
[Abstract](#)

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