

Foot & Ankle Research Review™

Making Education Easy

Issue 39 – 2019

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Abbreviations used in this issue:

EVA = ethylene-vinyl acetate
RA = rheumatoid arthritis
RCT = randomised controlled trial
SLE = systemic lupus erythematosus
VAS = visual analog scale



Podiatrists Board of New Zealand

Welcome to Issue 39 of Foot and Ankle Research Review.

In this issue I review a broad mix of recent publications. I am particularly interested to see the results of the international orthotic survey related to prescribing habits in rheumatoid arthritis between UK, Australian and New Zealand podiatrists. Stewart et al., also provides succinct detail on foot and ankle characteristics in people with systemic lupus erythematosus. I was also surprised by the findings from Newton et al., surrounding the relevance of limited joint motion to the diabetic foot in the UK high-risk foot setting. The study by Yavuz et al., also raises some interesting questions surrounding the significance of increased foot temperature in the diabetic foot.

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

Kind regards,

Associate Professor Matthew Carroll

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Research Review thanks Foot Science International for their sponsorship of this publication, and their support for ongoing education for healthcare professionals.

Independent commentary by Associate Professor Matthew Carroll

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Foot orthoses for people with rheumatoid arthritis: a survey of prescription habits among podiatrists

Authors: Chapman LS et al.

Summary: The foot orthosis prescription habits of UK (n = 88), Australian (n = 68) and New Zealand (n = 27) podiatrists for people with rheumatoid arthritis (RA) were examined via a self-administered online survey. NZ podiatrists were more likely to prescribe prefabricated orthoses for both early (n = 16; 59%) and established (n = 10; 37%) RA, Australian podiatrists were more likely to prescribe customised orthoses for both early (n = 32; 47%) and established (n = 46; 68%) RA, and UK podiatrists were more likely to prescribe prefabricated orthoses for early RA (n = 47; 53%) and customised orthoses for established RA (n = 47; 53%). Prior to manufacturing customised orthoses, NZ and UK podiatrists more often used foam impression boxes for capturing a model of the feet, while Australian podiatrists more often used electronic scanning and plaster of Paris. Australian podiatrists also more frequently used computer-aided manufacture compared with UK and NZ podiatrists. More flexible shell materials for established RA were used in all three countries and cushioning top covers (e.g. PORON® or polyurethane) were most frequently specified for both disease stages.

Comment: This study highlights the similarities and discrepancies in the use of foot orthoses across the UK, Australia and NZ. Whilst providing guidance on international practices the data highlights a lack of consensus on how best to manage early and established RA with foot orthoses. Notably, there were differences in casting methods, with UK and NZ podiatrists using foam box casting regularly, whereas digital scanning and plaster of Paris casting were more commonly used in Australia. The use of orthotic material varied. In early RA, semi-flexible foot orthoses (high-density EVA) were more commonly prescribed by NZ podiatrists and a semi-rigid material was more commonly used by Australian podiatrists. For established RA, semi-flexible shell and rearfoot materials were reported to be most frequently specified by UK and Australian respondents. Comparatively, NZ participants reported most frequently specifying highly-flexible (e.g. medium or low density EVA) shell and rearfoot posting materials. These findings highlight inconsistencies surrounding the application of foot orthoses. It would be interesting to know if the podiatrists' prescribing habits are in some way related to their undergraduate educational foundations surrounding orthotic prescription and management. This is an interesting field of research to watch.

Reference: *J Foot Ankle Res.* 2019;12:7

[Abstract](#)

Challenges of foot self-care in older people: a qualitative focus-group study

Authors: Miikkola M et al.

Summary: This qualitative, descriptive Finnish study investigated experiences of foot self-care from the perspective of healthy older people (n = 17) recruited from daytime activity centres. Participants were assigned to one of four focus groups and data were analysed using inductive content analysis. Participants reported that healthcare professionals neglected patients' feet and described their own foot self-care as including various methods. While they identified that foot self-care was important, it was not systematically carried out. They reported being hindered by the following factors: physical (e.g. changes in nail structure), internal (e.g. related to ageing) and external (e.g. seeking help from multi-level professionals).

Comment: Foot problems are a major source of anxiety for older adults. This study revealed three overarching factors associated with their foot care practices. (1) Physical factors – changes to nails and skin and the ability to reach their feet determined their need to seek professional help. (2) External factors – treatment and professional care were sought when their problems seemed too severe to handle by themselves. Finding advice about self-care was difficult, many do not ask for help from their immediate family and visiting a foot-care specialist was seen as an expensive but valuable investment for older people. (3) Internal factors - a lack of motivation also impaired foot self-care. The participants were not in the habit of looking after their feet; therefore, they did not do it frequently. This manuscript highlights the need to increase the awareness of foot health promotion to the older adult. There are numerous key points revealed by this research that the clinician could use to develop a tailored education package for their patients.

Reference: *J Foot Ankle Res.* 2019;12:5

[Abstract](#)

'Losing' joint mobility in feet and podiatry practice: a qualitative investigation of the role of limited joint mobility in the clinical assessment of the diabetic foot

Authors: Newton V et al.

Summary/Comment: This UK-based study involving podiatrists employed by the NHS, investigated their perspectives of limited joint mobility (LJM) in relation to clinical assessment of the diabetic foot. Five major themes were revealed: Theme 1 "fallen off the radar" assessment of joint range of motion was relatively ignored. Theme 2 "pass the LJM glasses please" LJM does not have a fixed appearance and defining foot deformity was subjective and problematic. Theme 3 "this is the real world" participants agreed that assessment of LJM was not a priority in the assessment of the diabetic foot; wound management is the priority. Theme 4 "we need a recipe book" there is a need for LJM research and guidance with a meaningful clinical application. Theme 5 "the awakening" due to the siloed structure of podiatric practice, management has become focused on the diabetic foot – those working in the NHS require more training surrounding the relevance of LJM. This research highlights the potential problem with a highly specialised practice with narrow focus. I agree that the relevance of LJM in the management of the diabetic foot requires clarification. If LJM is related to wound healing then it seems natural that clinical practice will begin to consider how best to manage LJM.

Reference: *The Diabetic Foot Journal* 2018;21(4):254-9

[Abstract](#)

Objectively-assessed foot and ankle characteristics in people with systemic lupus erythematosus: a comparison with age- and sex-matched controls

Authors: Stewart S et al.

Summary: This study in 54 people with SLE compared objectively-assessed foot and ankle characteristics to those of 56 age- and sex-matched controls. SLE patients had reduced muscle force during plantar flexion, dorsiflexion, inversion and eversion (all $p < 0.001$), increased foot posture indices ($p = 0.007$), greater foot problem scores ($p = 0.001$), greater vibratory perception ($p = 0.001$) and more frequent abnormal ankle brachial index (OR 3.13; $p = 0.044$). Compared to controls, SLE patients also had reduced peak pressures and greater pressure-time integrals for all foot regions, reduced step and stride length, velocity and cadence, and greater step, swing, stance and single- and double-support times (all $p < 0.001$); they also reported greater foot pain ($p < 0.001$).

Comment: SLE is an autoimmune rheumatic disease characterised by multi-organ involvement. The clinical presentation of SLE is diverse, with manifestations in the cutaneous, musculoskeletal, cardiovascular and neurological systems. This NZ-based study highlights the need for increased awareness of foot health in people with SLE. Of note, study data indicated reduced strength in the foot and ankle musculature, which may be attributable to reduced physical capacity and fatigue. Plantar pressure analysis indicated high-pressure time integrals that may be attributable to morphological and soft tissue changes in the foot. More research is definitely required to assess the efficacy of foot-specific interventions in people with SLE.

Reference: *Arthritis Care Res.* 2019;Jan 10 [Epub ahead of print]

[Abstract](#)

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Temperature as a causative factor in diabetic foot ulceration: a call to revisit ulcer pathomechanics

Authors: Yavuz M et al.

Summary: This observational case-control study involving 37 diabetic individuals examined temperature as a biomarker and as a causative factor in the development of diabetic foot ulceration. Nine of the enrolled patients had diabetic neuropathy and ulcer history (DFU), 14 had diabetic neuropathy (DN), and 14 were non-neuropathic (DC). An infrared thermal camera was used to measure resting barefoot plantar temperatures at four anatomical regions (hallux, medial forefoot, central forefoot and lateral forefoot). In each foot region, mean temperatures were $>30.0^{\circ}\text{C}$ in the DFU and DN groups, while the DC group exhibited temperatures below 30.0°C at all sites. The greatest differences in mean temperatures were observed between the DFU and the DC group; temperature differences ranged from 3.2°C in the medial forefoot to 4.9°C in the hallux.

Comment: An interesting article that highlights first, the potential relationship between increased foot temperature and ulceration, and second, the clinical value of obtaining plantar temperature values to identify potential at-risk areas. Although the study demonstrated higher temperatures in participants with previous diabetic foot ulceration and diabetic neuropathy, the limitations of the study need consideration. Namely, the population was very small, there was no control group, and temperature measurement was not standardised. The authors also frequently refer to temperatures above 35°C being responsible for deep tissue damage and necrosis – temperature guidelines that were derived from animal-based research (swine). The authors raise some thought-provoking points surrounding socks and footwear. Both these treatments are advocated in the management of the diabetic foot, but the combination of both therapies raises the temperature of the foot. The authors advocate for regular temperature screening of the diabetic foot and where temperatures exceed 35°C , efforts should be made to reduce the mechanical load in the area in order to decrease tissue temperature. I wonder if limited joint motion is a potential factor that leads to increased tissue temperature.

Reference: *J Am Podiatr Med Assoc.* 2018;Nov 14 [Epub ahead of print]
[Abstract](#)

Efficacy of heavy eccentric calf training for treating mid-portion Achilles tendinopathy: a systematic review and meta-analysis

Authors: Murphy MC et al.

Summary: The effectiveness of heavy eccentric calf training (HECT) in comparison with natural history, traditional physiotherapy, sham interventions or other exercise interventions for improvements in function and pain in mid-portion Achilles tendinopathy was assessed in this systematic review and meta-analysis. Seven relevant RCTs with the Victorian Institute of Sports Assessment-Achilles (VISA-A) as the primary outcome assessing pain and function were identified from PUBMED, CINAHL (Ovid) and CINAHL (EBSCO) up until September 2018. The findings indicate that HECT may be superior to both natural history (mean difference 20.6; 95% CI 11.7-29.5, one study) and traditional physiotherapy (mean difference 17.70; 95% CI 3.75-31.66, two studies). While unlikely to be clinically significant, the analysis also revealed that HECT might be inferior to other exercise interventions (mean difference -5.65 ; 95% CI -10.51 to -0.79 , three studies).

Comment: There have been numerous systematic reviews in the past decade that have demonstrated the evidence surrounding the use of HECT, which is also referred to as the Alfredson eccentric protocol in the management of mid-portion Achilles tendinopathy. This robust systematic review included only studies that had used the VISA-A as the outcome measure, the only valid and reliable outcome measure for mid-portion Achilles tendinopathy. Overall the review again highlights the limited evidence to support the efficacy of HECT in the management of Achilles tendinopathy. With evidence mounting against the efficacy of HECT, combined with the time-consuming nature of the traditional program (180 repetitions per day), I wonder how often this program is used in its original form by clinicians? To that point the review includes in a supplementary appendix details of the protocol of five alternative programs (1) the modified HECT that is a low-volume version of HECT; (2) concentric training; (3) eccentric overload training that is also referred to as the Silbernagel protocol; (4) heavy slow resistance training; and (5) the Stanish protocol. It would be interesting to see some research that investigates tendon imaging changes, particularly ultrasound imaging in relation to HECT programs.

Reference: *Br J Sports Med.* 2019;Jan 13 [Epub ahead of print]
[Abstract](#)

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Physical and mechanical therapies for lower limb symptoms in children with hypermobility spectrum disorder and hypermobile Ehlers-Danlos syndrome: a systematic review

Authors: Peterson B et al.

Summary: This systematic review investigated the evidence for physical and mechanical treatments for lower limb problems in children with hypermobility spectrum disorder and hypermobile Ehlers-Danlos syndrome (hEDS). Two RCTs ($n = 86$) evaluating differences between generalised versus targeted physiotherapy programs and between performing knee extension exercises to the neutral versus hypermobile range in children with lower limb problems associated with hypermobility were included (no RCTs evaluating mechanical therapies were identified). None of the physical therapies evaluated showed a clear benefit and the authors concluded that there is limited evidence to guide the use of physical and mechanical therapies for lower limb problems in children with hypermobility spectrum disorder or hEDS.

Comment: Hypermobility spectrum disorder is the new classification for what was previously called joint hypermobility syndrome, which refers to hypermobility of multiple joints, in the absence of a well-defined syndrome. hEDS is the new classification of what was previously called Ehlers-Danlos syndrome-hypermobility type, with the updated diagnostic criteria now much tighter. The review highlights the lack of evidenced guidance available from RCTs to inform clinical practice. From the evidence presented in the review, there is no clear benefit of a targeted physical therapy (targeting symptomatic joints) program compared with a generalised physical therapy program (targeted at general muscle strength). Physical therapy prescription may provide benefit in regard to pain intensity, however, this assumption is not currently supported by research.

Reference: *J Foot and Ankle Res.* 2018;11:59
[Abstract](#)



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Full length foot orthoses have an immediate treatment effect and modify gait of children with idiopathic toe walking

Authors: Michalitsis J et al.

Summary: This within-subject RCT investigated whether the wearing of high-top boots with a custom made rigid contoured carbon fibre foot orthosis increased the number of heel contacts during gait and changed spatiotemporal gait parameters in children (n = 15; 10 males) with idiopathic toe walking. Heel contacts and spatiotemporal parameters were measured using an 8.3 m Gaitrite® mat while wearing the boots and orthoses, and while barefoot walking. Walking while wearing the boots and orthoses was associated with an immediate increase in heel contact (p = 0.021), with a large increase in stride time compared to barefoot walking (p = 0.006), a decrease in the percentage of swing phase in the gait cycle (p < 0.010), an increase in the stance phase (p < 0.010) and an increase in double support time (p < 0.001).

Comment: Albeit in a very small sample, the combination of the foot orthoses and footwear significantly increased the percentage of heel strikes in 89% of steps taken by idiopathic toe walkers compared to 64% when barefooted. There were also some interesting secondary findings with children responding differently to the test conditions (footwear only and footwear plus foot orthoses); some increased their toe walking with footwear or footwear and orthoses. Why this occurred is unknown, but highlights the variability in presentation of this population. There were also gait modifications suggesting improvements in balance control and foot position awareness. The efficacy of foot orthoses in the long-term management of idiopathic toe walking is unknown, but this study did demonstrate that a combined treatment immediately reduced the occurrence of toe walking, and improved gait stability by increasing stride time and double support time. An exciting area of research where future research will look towards how the orthoses change the mechanics of gait and whether they are as effective in all shoe types.

Reference: *Gait Posture* 2018;68:227-31

[Abstract](#)

Foot mobilization and exercise program in combination with toe separator improves outcomes in women with moderate hallux valgus at the one-year follow-up: a randomized clinical trial


Author: Abdalbary SA


Summary: This RCT aimed to identify the effects of a 3-month, 36-session foot mobilisation and exercise program, plus use of a toe separator, versus no intervention (waiting list) on symptomatic moderate hallux valgus in 56 female patients. Treatment recipients experienced greater improvement in mean VAS pain score (5.6 points at baseline vs 2.4 points at 1-year follow-up), mean American Orthopedic Foot and Ankle Society (AOFAS) score (46.1 points vs 74.5 points), mean ankle dorsiflexion passive range of motion (9.5° vs 13.2°), hallux plantar flexion and hallux abduction strength (50.4 N vs 62.9 N and 6.4 N vs 8.8 N, respectively), toe grip strength (65.2 N vs 93.1 N), radiographic angular measurements of mean hallux valgus angle (32.7° vs 25.8°), and first-second intermetatarsal angle (14.0° vs 12.0°); all p < 0.001. Comparisons between treatment group and controls revealed significant differences (p < 0.001) for hallux valgus angle, first and second intermetatarsal angle, pain, AOFAS, ankle dorsiflexion, hallux plantar flexion and abduction strength, and toe grip strength after treatment and at 1-year follow-up.

Comment: I am always intrigued to read studies that assess conservative manual therapies in the management of hallux valgus. Can manual therapy prevent the need for surgery? Using a combination of toe separators, isometric hallux strengthening and hallux, midfoot and rearfoot mobilisations, data demonstrated improvement in pain, functional disability, ankle dorsiflexion range of motion, hallux plantar flexion and abduction strength, and toe grip strength, in addition to decreasing the hallux valgus and first-second intermetatarsal angles. Although the validity of the functional disability results are questionable, as the AOFAS scale used to quantify functional disability is not validated, the results add to the limited evidence supporting the use of manual therapy modalities in the conservative management of hallux valgus. Whether the benefits found in the study are related to the changes in strength or the mobilisations, or a combination of both, remains unanswered and raises the need for further research.

Reference: *J Am Podiatr Med Assoc.* 2018;Apr 23 [Epub ahead of print]

[Abstract](#)

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Validation of a weight bearing ankle equinus value in older adults with diabetes

Authors: Searle MOsteo A et al.

Summary: This study validated a proposed weight-bearing equinus value (dorsiflexion <30°), assessed in a lunge using an inclinometer placed on the anterior tibia, in young adults without diabetes, and examined the clinical effects of this degree of ankle dorsiflexion restriction on forefoot plantar pressures in older adults with diabetes. A weight bearing equinus of <30° was within the restricted range in young adults without diabetes. In older adults with diabetes this ankle restriction was associated with increased barefoot forefoot peak pressure (r = 0.274; p = 0.005) and pressure-time integrals (r = 0.321; p = 0.001). The diabetic equinus group had significantly higher barefoot peak pressure (mean kPa 787.1 vs 652.0; p = 0.025) and pressure-time integrals (mean kPa 97.8 vs 80.4; p = 0.017) than the diabetic non-equinus group.

Comment: This Australian-based study assessed ankle joint dorsiflexion with the lunge test using a digital inclinometer placed on the anterior tibia. The study was founded on the recent suggestion by [Baumbach et al.](#) that dorsiflexion <30° in young healthy adults should be regarded as restricted. The technique used to quantify ankle joint motion by this study is easily reproducible in the clinical setting with minimal equipment-related cost. With this in mind, and the study findings that ankle dorsiflexion of <30° when measured at the anterior tibia does fall in a restricted range in a young healthy cohort and is also associated with elevated barefoot forefoot plantar pressures in older adults with diabetes, make this a promising clinical test. This test definitely warrants further validation, particularly if the value of <30° is actually indicative of ankle equinus. Undoubtedly further studies may result in changes to this value.

Reference: *J Foot Ankle Res.* 2018;11:62

[Abstract](#)

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