Collaborative Care for Better Outcomes

ler

LOWER EXTREMITY REVIEW

November 25 / volume 17 / number 11

Failed Forefoot MIS Surgery is Preventable

10 8 SHORTTAKES FOR QUICK REVIEW

20 PREVENTING PTTD AND ADULT ACQUIRED FLATFOOT

24 GOVERNMENT FUNDING CUTS CAN HURT BOTH PATIENTS AND CLINICIANS

26 MULTIDISCIPLINARY TEAMS JOIN TOGETHER TO IMPROVE LIMB PRESERVATION

28 PATIENTS NEED A BENEFICIAL GUIDE TO AFOS AFTER STROKE: A BOOK REVIEW

30 SIMPLE CLINICAL ADVICE TO COMBAT TYPE 2 DIABETES

32 CHOOSING 3D SCANNING HARDWARE IS CLINICAL, NOT JUST TECHNICAL

NOW OPEN

lerMARKETPLACE

A New Kind of Exhibit Hall

Available 24/7/365

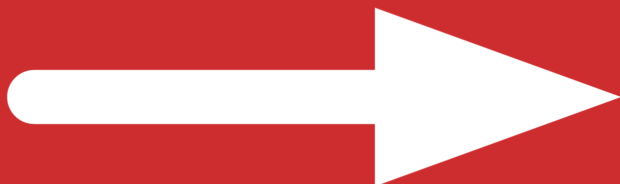
lerMARKETPLACE.com is THE place to learn about the products you need now from the names you trust.

*48HR

ORTHOTIC LAB TURNAROUND

FIRE YOUR LAB — HIRE US

WE'RE NOT KIDDING



TRY US

*Our company average turnaround time.

HERE'S WHAT YOU ARE GOING TO LOVE:

- 48 Hour Turnaround Time
- Outstanding Clinical Service
- High Quality, Custom Orthotics
- Dedicated & Experienced Territory Managers
- 45-Day Money Back Guarantee

START TODAY
Call 833-496-2340

Footmaxx®

Fall in Love With Your Orthotic Lab

Unrivaled custom orthotics are just the beginning at Orthotica Labs

MAY WE TELL YOU MORE?

888.895.1305

orthotica.com/learn-more

LOWER EXTREMITY REVIEW
ler
VOLUME 17 NUMBER 11 LERMAGAZINE.COM

November 2025

contents

SHORTTAKES FROM THE LITERATURE

10
- Partial Nail Avulsion With or Without Phenolization for Ingrown Toenails
- Indoor vs. Regular Custom-Made Footwear for Diabetics at High Risk Of Foot Ulceration
- Is Local Steroid Injection Predictive of Patient Response to Endoscopic Plantar Fascia Release
- Plantar Pressure in Recreational Athletes Running in Maximal and Traditional Shoes
- Achilles Tendon Stiffness and Jumping: Comparative Study of Soccer and Basketball Athletes
- Ozone Successful Treatment of Venous Leg Ulcers and Diabetic Foot Ulcers
- Diagnostic Musculoskeletal Ultrasound for Plantar Fascia
- Exergame Program Improves Gait in People with Parkinson's Disease

INNOVATIONS IN BIOMECHANICS

32 **CHOOSING THE RIGHT 3D SCANNING HARDWARE: WHAT MATTERS MOST**

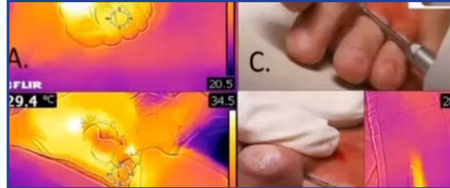
One innovative expert shares what he's learned about the ins and outs of choosing 3D scanning hardware and the clinical implications.

By Dean Hartley *(Podiatrist & Adjunct Engineering Fellow–University of Queensland)*

AD INDEX

35 **GET CONTACT INFO FOR ALL OF OUR ADVERTISERS**

COVER STORY



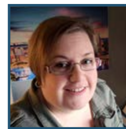
16 **FAILED FOREFOOT MIS SURGERY: WHAT CAN YOU DO TO PREVENT THIS FROM HAPPENING**

Reoccurrence and revision in MIS surgery can be avoided. Dr. Sugino shares insightful tips and her experiences to mitigate and prevent common pitfalls.

By Raquel Sugino DPM, MS, FACFAS

BOOK REVIEW

28 **BRACE YOURSELF EVERYTHING YOU NEED TO KNOW ABOUT AFOS AFTER STROKE BY JENNIFAYE V. BROWN PT, MSPT, PHD, NCS, CAPS: A REVIEW**



When facing an unexpected medical diagnosis, like stroke, patients and clinicians alike need an easy guide to help manage the unknowns and answer questions about what comes next. Our editor gives a review of this new book.

By January Shoaf ler Magazine Editor

NEW & NOTEWORTHY

36 **PRODUCTS, ASSOCIATION NEWS & MARKET UPDATES**

THE LAST WORD

40 **EXERCISE IS MEDICINE**

FEATURE ARTICLES

20 **EARLY ASSESSMENT AND EARLY INTERVENTION OF ACQUIRED ADULT FLATFOOT TO PREVENT FUTURE PTTD**

Failing to warn asymptomatic patients about their risk of PTTD can be a major oversight in clinical practice. Dr. McGuire shares the benefits of preventative orthotics and early intervention to improve patient outcomes.

By Dr. James McGuire DPM, LPT, LPed, FAPWHc

24 **EXPERT OPINION: FUNDING CUTS THREATEN BOTH THE HEALTH OF PATIENTS AND THE PROFESSION**

One O&P expert shares the consequences and potential drawbacks that come along with federal funding cuts to research grants.

By Géza F. Kogler, Ph.D, CO

26 **THE BEGINNING OF A MOVEMENT: HOW CLIFF 2025 AND THE MAPS INITIATIVE ARE SHAPING THE FUTURE OF LIMB PRESERVATION**

One clinician describes the incredible impact for patients when multiple medical disciplines band together.

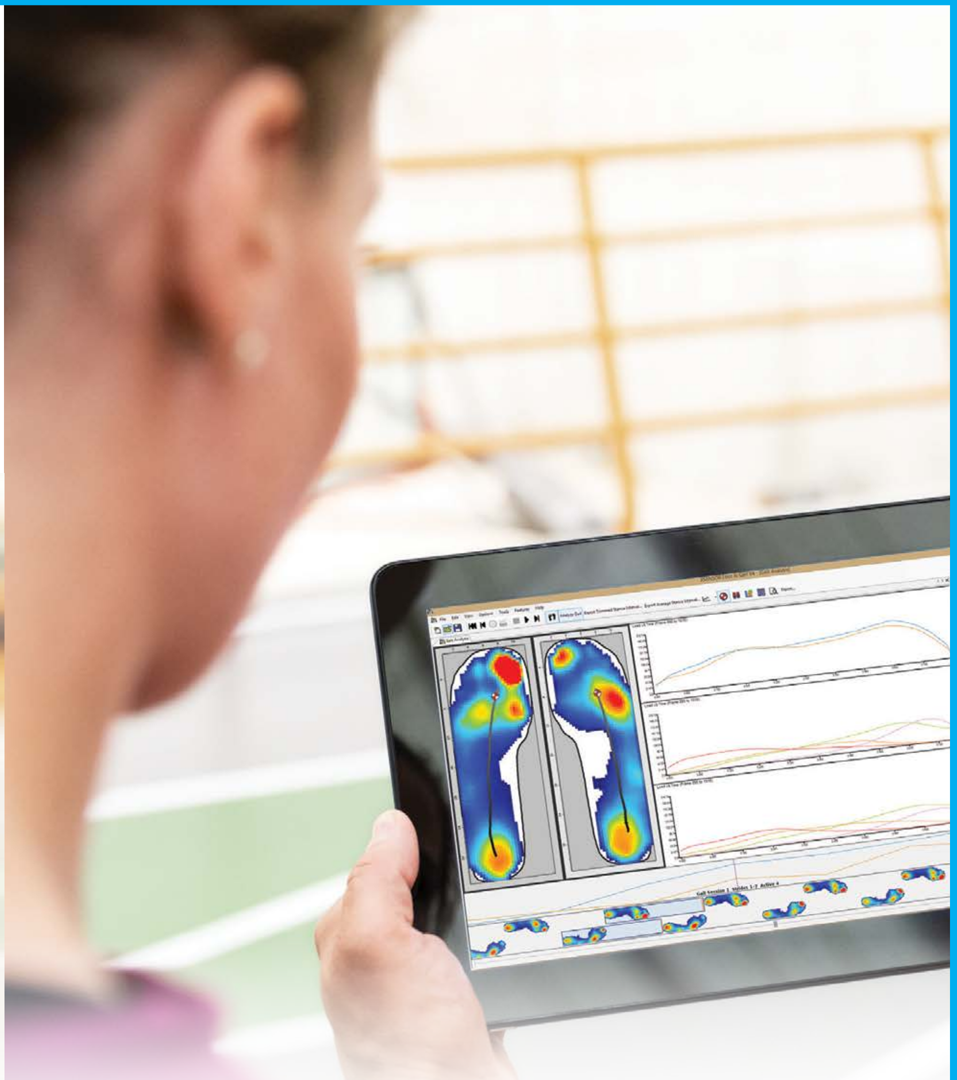
By Laiq Raja MD, FACC, FSCAI

30 **COMBATING THE EXPLOSION OF TYPE 2 DIABETES WITH EXERCISE, DIET AND MENTAL CONTENTMENT**

An expert in sports medicine gives great advice for clinicians and patients alike for preventing type 2 diabetes.

By Lawrence Rubin DPM and Dr. Robert Weil DPM

The views and opinions expressed in this issue are those of the authors and do not necessarily reflect the official policy or position of Lower Extremity Review.



MAKE CONFIDENT DECISIONS WITH RELIABLE, HIGH-RESOLUTION LAB-QUALITY INSOLE PRESSURE DATA

For foot clinicians and physical therapists, XSENSOR®'s X4 Intelligent Insole System provides accurate foot function, gait analysis, and plantar pressure data for any patient evaluation scenario. With fast, compact, and discreet on-shoe wireless electronics paired with durable, thin, and flexible sensors, the X4 system offers assurance of quality data to better understand the impact of orthotic, surgical, or therapeutic interventions and pathology.

EASY TO USE
Fast set-up and user-friendly software means you can capture and review plantar data in under 10 minutes

UNPARALLELED IMAGERY
Highest quality, high-resolution dynamic pressure data and imagery

ADVANCED FUNCTIONALITY
Complete analysis for clinical and research testing with XSENSOR's Foot & Gait VU software

LAB-QUALITY DATA
High-speed sampling allows for collection of anatomically accurate in-shoe data from 230 sensing points per foot

WIRELESS & UNDETECTABLE
Ultra-thin sensors conform to the footbed and compact on-shoe electronics are virtually undetectable to the wearer

ROBUST SENSORS & ELECTRONICS
Easy-to-use sensors are ready out of the box and support trouble-free testing

CONTACT US TODAY TO LEARN MORE

www.xsensor.com | sales@xsensor.com

XSENSOR
Intelligent Dynamic Sensing

LOWER EXTREMITY REVIEW

ler

Richard Dubin
Publisher and Chief Executive Officer
rich@lermagazine.com | 518.221.4042

STAFF

Editor Emeritus
Janice T. Radak | janice@lermagazine.com

Editor
January Shoaf | january@lermagazine.com

Associate Editor
Laura Fonda Hochnadel | laura@lermagazine.com

Marketing Manager
Glenn Castle | glenn@lermagazine.com

Graphic Design/Production and Website Development
Anthony Palmeri | PopStart Web Dev
webmaster@lermagazine.com

Lower Extremity Review

Lower Extremity Review informs healthcare practitioners on current developments in the diagnosis, treatment, and prevention of lower extremity injuries. LER encourages a collaborative multidisciplinary clinical approach with an emphasis on functional outcomes and evidence-based medicine. LER is published monthly, except for a combined November/December issue and an additional special issue in December, by Lower Extremity Review, LLC.

Subscriptions may be obtained for $38 domestic and $72 international by writing to: LER, PO Box 390418, Minneapolis, MN, 55439-0418. Copyright ©2025 Lower Extremity Review, LLC. All rights reserved. The publication may not be reproduced in any fashion, including electronically, in part or whole, without written consent. LER is a registered trademark of Lower Extremity Review, LLC. POSTMASTER: Please send address changes to LER, PO Box 390418, Minneapolis, MN, 55439-0418.

LOWER EXTREMITY REVIEW
41 State St. • Suite 604-16 • Albany, NY 12207
518.452.6898

Lower Extremity Review Mission

Showcasing evidence and expertise across multiple medical disciplines to build, preserve, and restore function of the lower extremity from pediatrics to geriatrics.

EDITORIAL PILLARS

- Biomechanics matter
- Movement is essential
- Injury prevention is possible
- Diabetic foot ulcers can be prevented
- Collaborative care leads to better outcomes

EDITORIAL ADVISORY BOARD

David G. Armstrong, DPM, MD, PhD
Professor of Surgery and Director, Southwestern Academic Limb Salvage Alliance (SALSA), Keck School of Medicine of the University of Southern California, Los Angeles, California

Windy Cole, DPM
Medical Director, Wound Care Center, University Hospitals Ahuja Medical Center
Adjunct Professor/Director Wound Care Research
Kent State University College of Podiatric Medicine
Cleveland, Ohio

Robert Conenello, DPM
Orangetown Podiatry
Clinical Director, NJ Special Olympics
NYPD Honorary Surgeon
Greater New York City Area, New York

Sarah Curran, PhD, FCPodMed
Professor, Podiatric Medicine & Rehabilitation
Cardiff Metropolitan University
Cardiff, United Kingdom

Paul DeVita, PhD
Director, Biomechanics Laboratory
Leroy T. Walker Distinguished Professor of Kinesiology
East Carolina University
Greenville, North Carolina

Stefania Fatone, PhD, BPO
Professor and Association Chair
Department of Rehabilitation Medicine
University of Washington
Seattle, Washington

Geza Kogler, PhD, CO
Program Director
MS Prosthetics and Orthotics
Kennesaw State Unversity, Clinical Biomechanics Laboratory
Kennesaw, Georgia

Robert S. Lin, MEd,CPO,FAAOP
Managing Partner Biometrics INC.
Hartford, Connecticut

Bijan Najafi, PhD
Professor of Surgery
Director, interdisciplinary Consortium on Advanced Motion Performance (iCAMP)
Director, Clinical Research in Vascular Surgery
Baylor College of Medicine
Houston, Texas

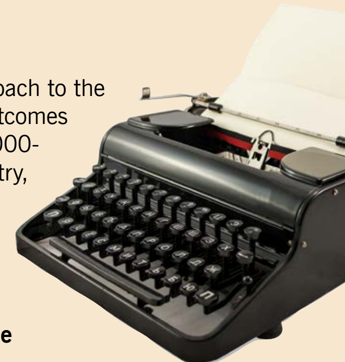
Antonio Robustelli, MSc, SCS
Sports Performance Consultant
Applied Sport Scientist/Technologist
Strength & Conditioning Specialist
Salerno, Italy

Jarrod Shapiro, DPM
Vice Chair, Department of Podiatric Medicine, Surgery & Biomechanics
Associate Professor of Podiatric Medicine, Surgery & Biomechanics
Western University of Health Sciences
Liaison, American College of Podiatric Medicine
Pomona, California

Philip Stotter, CEP
Visionary at Stotter Technologies
Director of Sports Science
V1 Sports
Cleveland, Ohio

Bruce E. Williams, DPM
Medical Director
Go4-D
Chicago, Illinois

INFORMATION FOR AUTHORS



LER encourages a collaborative multidisciplinary clinical approach to the care of the lower extremity with an emphasis on functional outcomes using evidence-based medicine. We welcome manuscripts (1000-2000 words) that cross the clinical spectrum, including podiatry, orthopedics and sports medicine, physical medicine and rehabilitation, biomechanics, obesity, wound management, physical and occupational therapy, athletic training, orthotics and prosthetics, and pedorthics.

See detailed Author Guidelines at lermagazine.com – click the Editorial tab on the homepage.

ELECTRONIC SUBMISSIONS

Please attach manuscript as an MS Word file or plain text. Tables may be included in the main document, but figures should be submitted as separate jpg attachments. Send to: **january@lermagazine.com**

ShortTakes From the LITERATURE

PARTIAL NAIL AVULSION WITH OR WITHOUT PHENOLIZATION FOR INGROWN TOENAILS

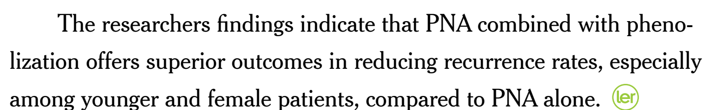
iStockphoto.com #1438365566

Ingrown toenails, a common and often painful condition, frequently require surgical intervention for effective management. This study aimed to compare the clinical outcomes of partial nail avulsion (PNA) with and without adjunctive phenolization, specifically focusing on recurrence and postoperative wound infection rates.

A total of 140 patients were included and randomly divided into 2 groups: 70 patients in Group A (PNA with phenolization) and 70 patients in Group B (PNA without phenolization). For categorical variables, statistical analysis was conducted using the chi-square test; a *P*–value of 0.05 was regarded statistically significant. To assess other influencing elements, a subgroup study by age and gender was carried out.

Recurrence was significantly lower in Group A with 1 patient (1.43%) compared to 7 patients (10.0%) in Group B ($P=0.029$). Wound infection was also reduced in Group A, occurring in 4 patients (5.71%) versus 12 patients (17.14%) in Group B ($P=0.034$). Among younger patients (12–35 years), recurrence was 0 out of 46 (0.0%) in Group A versus 6 out of 41 (14.63%) in Group B ($P=0.007$), while in older patients (36–60 years), recurrence rates were similar (4.17% vs. 3.45%; $P=0.891$). Female patients in Group A had no recurrence (0 out of 31; 0.0%) compared to 4 out of 32 (12.5%) in Group B ($P=0.042$).

The researchers findings indicate that PNA combined with phenolization offers superior outcomes in reducing recurrence rates, especially among younger and female patients, compared to PNA alone.



Source: *Shehar Bano Z, Ahmad Rana F, Irfan A, Tariq A, Iqbal MS. Comparison of partial nail avulsion with or without phenolization in the management of ingrown toenails. Cureus. 2025 10;17(5):e83837. doi: 10.7759/cureus.83837.*

INDOOR VS. REGULAR CUSTOM-MADE FOOTWEAR FOR DIABETICS AT HIGH RISK OF FOOT ULCERATION

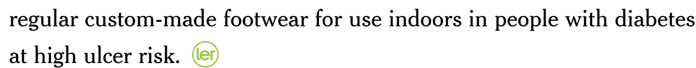
iStockphoto.com #999892800

Custom-made footwear designed specifically for indoor use increases footwear adherence in people with diabetes at high ulcer risk. The design and biomechanical requirements of such footwear are important if they are to safely replace regular custom-made footwear for indoor use. Researchers aimed to compare indoor-specific versus regular custom-made footwear for design characteristics and biomechanical function.

Indoor-specific pressure-optimized custom-made footwear (ie lower weight, easier to don and doff, more comfortable and breathable materials) was provided to 36 participants with diabetes, neuropathy, and a recently healed plantar foot ulcer or amputation, who already had regular pressure-optimized custom-made footwear. Both footwear types were assessed for their shoe design features and compared using Cohen's Kappa and percentage agreement. In-shoe plantar pressures were measured during walking in both footwear types, from which multiple (center-of-)pressure parameters were calculated and compared using paired t-tests and statistical parametric mapping.

Of the 36 participants, a total 132 shoes, 66 per footwear type, were analyzed. Cohen's Kappa ranged from -0.17 to 0.72 for different design features and percentage agreement from 45% to 97%. Outcomes for all peak pressure parameters were statistically non-significantly higher (0–3 %, $P > 0.05$) in the indoor-specific compared to regular footwear. Center-of-pressure parameters were also not significantly different.

No statistically significant or clinically relevant differences were found in biomechanical functions between indoor-specific and regular custom-made footwear, despite differences found in footwear design. Indoor-specific footwear is thus a biomechanically safe alternative to



regular custom-made footwear for use indoors in people with diabetes at high ulcer risk.

Source: *Vossen Le, van Netten Jj, Busch-Westbroek Te, Bus Sa. Design and biomechanical function of indoor-specific versus regular custom-made footwear for people with diabetes at high risk of foot ulceration. Clin Biomech (Bristol). 2025;127:106605. doi: 10.1016/j.clinbiomech.2025.106605.*

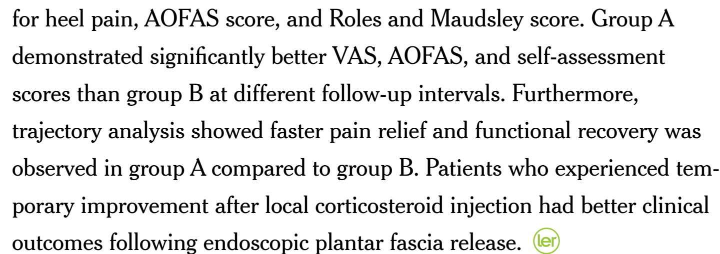
IS LOCAL STEROID INJECTION PREDICTIVE OF PATIENT RESPONSE TO ENDOSCOPIC PLANTAR FASCIA RELEASE

iStockphoto.com #1319981755

Plantar fasciitis is a very common issue with many treatment options. The purpose of this study was to investigate if patient's response to previous local steroid injection is predictive of their response to endoscopic plantar fascia release in regard to pain relief, functional recovery, and patient satisfaction. Researchers hypothesized that previous temporary improvement in response to local corticosteroid injection is associated with favorable outcomes following endoscopic release.

In a prospective non-randomized comparative study of 100 adult patients, who suffered from plantar fasciopathy for at least 1 year, and had reported either temporary or no response to 2 or more of conservative treatments, including local corticosteroid injection. Enrolled patients were non-randomly allocated by convenience sampling into 2 groups. The first 50 patients who reported improvement in response to local corticosteroid injection were allocated to group (A) The first 50 patients who did not report any improvement after injection were allocated to group (B). Both groups underwent endoscopic plantar fascia release. Clinical evaluation was carried out using the visual analogue scale (VAS), American Orthopaedic Foot and Ankle-Hindfoot Scale (AOFAS) and patient self-assessment (Roles and Maudsley score) preoperatively and at 4 and 8 weeks, 3, 6, 12, and 24 months postoperatively.

Both groups showed a statistically significant improvement in VAS



for heel pain, AOFAS score, and Roles and Maudsley score. Group A demonstrated significantly better VAS, AOFAS, and self-assessment scores than group B at different follow-up intervals. Furthermore, trajectory analysis showed faster pain relief and functional recovery was observed in group A compared to group B. Patients who experienced temporary improvement after local corticosteroid injection had better clinical outcomes following endoscopic plantar fascia release.

Source: *Mohamed M, Redwan M, Noaman H, Elsayed M. Does local steroid injection have a prognostic value for endoscopic plantar fascia release in chronic plantar fasciopathy? BMC Musculoskelet Disord. 2025 9;26(1):576. doi: 10.1186/s12891-025-08816-4.*

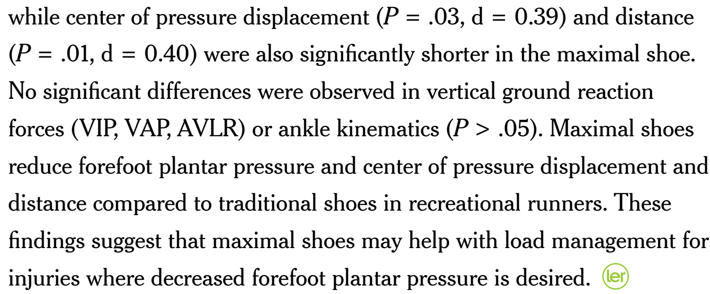
PLANTAR PRESSURE IN RECREATIONAL ATHLETES RUNNING IN MAXIMAL AND TRADITIONAL SHOES

iStockphoto.com #2199551110

Running is a popular competitive and recreational activity with numerous health benefits, including reduced risk of cardiovascular disease and all-cause mortality, and improved mental health. Despite these benefits, running continues to carry a high risk of injury. The primary objective of this study was to compare plantar pressure (peak forefoot and rearfoot pressure, center of pressure displacement and distance) between maximal and traditional running shoes in recreationally active individuals. A repeated-measures experimental design compared the 2 shoe conditions (maximal vs. traditional) within the same participants. Twenty recreationally active adults (11 females, 9 males) performed 5 overground running trials in a maximal and traditional shoe. Plantar pressure, vertical ground reaction forces, and ankle kinematics were measured using a combination of pressure insoles, motion capture, and force plates. Two-tailed paired t-tests with Benjamini-Yekutieli corrections were used to assess differences between shoe conditions ($\alpha = 0.05$), while effect sizes (Cohen's d) quantified the magnitude of observed differences. Peak forefoot plantar pressure was significantly lower in the maximal shoe ($P = .01$, $d = 0.47$),

Continued on page 12

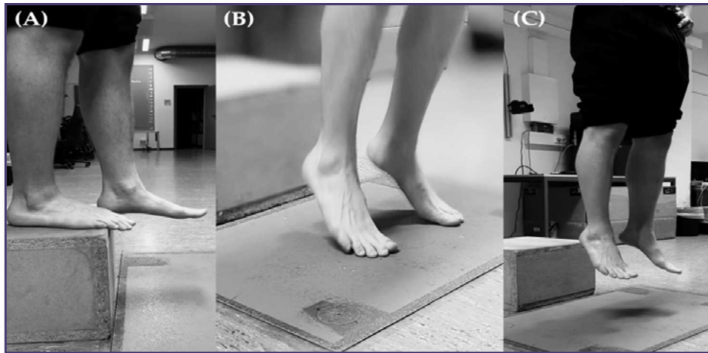
Continued from page 11



while center of pressure displacement (P = .03, d = 0.39) and distance (P = .01, d = 0.40) were also significantly shorter in the maximal shoe. No significant differences were observed in vertical ground reaction forces (VIP, VAP, AVLR) or ankle kinematics (P > .05). Maximal shoes reduce forefoot plantar pressure and center of pressure displacement and distance compared to traditional shoes in recreational runners. These findings suggest that maximal shoes may help with load management for injuries where decreased forefoot plantar pressure is desired.

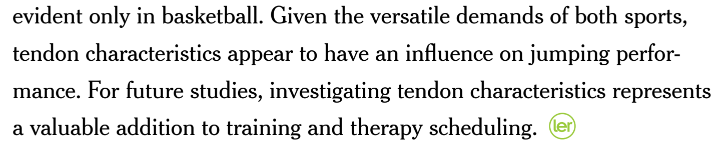
***Source:** Hannigan J, Giulietti N, Traeger B, Moore D, Boechler V, Giammichele K, Dean S. Plantar pressure in recreational athletes running in maximal and traditional shoes. J Sci Med Sport. 2025;28(11):955-959. doi: 10.1016/j.jsams.2025.06.004.*

ACHILLES TENDON STIFFNESS AND JUMPING: COMPARATIVE STUDY OF SOCCER AND BASKETBALL ATHLETES



An exemplary illustration of a drop jump performed: (A) starting position at the edge of the box (fall height 30 cm), (B) toe contact with the ground (force plate), and (C) take-off/flight phase after initial ground contact.

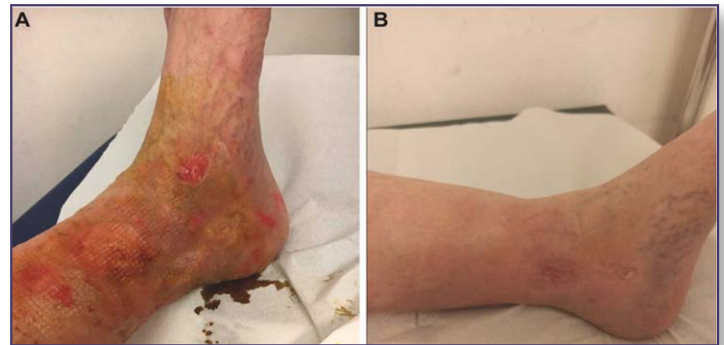
Tendon properties influence athletic performance, and Achilles tendon (AT) stiffness correlates with an athlete's jumping performance across sports. This study examined the relationship between AT stiffness and jumping performance in male athletes. Sixty-six males (24.9 ± 4.7 years; 22 basketball players (22.0 ± 4.1 years), and 44 soccer players (26.3 ± 4.4 years) participated. Reactive jumping performance (reactive strength index (RSI), jump height (JH), and ground contact time (GCT)) were assessed using drop jumps (fall height: 30 cm), and AT stiffness (supine position) was measured using the MyotonPro. Soccer players had a significantly higher AT stiffness (826.8 ± 90.5 N/m) than basketball players (754.1 ± 80.1 N/m, P = 0.002), but no differences were found in JH, RSI, or GCT (P > 0.05). JH and AT stiffness significantly correlated in basketball players (r = 0.448) but not in soccer players (r < 0.100). The multiple linear regression indicated that AT stiffness is significantly influenced by the sport type (soccer or basketball), while age, mass, and height remained non-significant. Despite higher AT stiffness in soccer players (which can be explained by different activity regimens), a moderate correlation between jumping performance and AT stiffness was



evident only in basketball. Given the versatile demands of both sports, tendon characteristics appear to have an influence on jumping performance. For future studies, investigating tendon characteristics represents a valuable addition to training and therapy scheduling.

***Source:** Schmidt D, Verderber L, Germano A, Nitzsche N. Correlations between achilles tendon stiffness and jumping performance: a comparative study of soccer and basketball athletes. J Funct Morphol Kinesiol. 2025 28;10(2):112. doi: 10.3390/jfmk10020112.*

OZONE SUCCESSFUL TREATMENT OF VENOUS LEG ULCERS AND DIABETIC FOOT ULCERS



Outcome of oxygen-ozone therapy (OOT) before (A) and following 5 sessions of OOT (B) in a 65 year-old patient with venous leg ulcer (VLU).

Venous leg ulcers (VLUs) and diabetic foot ulcers (DFUs) are chronic wounds associated with significant morbidity, high recurrence rates, and poor healing outcomes. Conventional treatments often fail to achieve satisfactory results, leading to prolonged pain, infection risks, and reduced quality of life. Oxygen-ozone therapy (OOT) has emerged as a potential adjunct to conventional wound care, with antimicrobial, anti-inflammatory, and tissue-regenerating properties. This study evaluates the efficacy of OOT in treating severe VLUs and DFUs.

A total of 25 patients (mean age, 57.2 ± 10.51) with refractory VLUs (n = 18) or DFUs (n = 7) received OOT alongside standard care. Treatment protocols included major autohemotherapy (O2-O3-MAHT), topical ozone application, and localized ozone injections. Clinical assessments included pain scoring (Numeric Rating Scale), microbiological evaluations, and logistic regression analysis to determine healing rates.

At 4 weeks, pain scores decreased by 73.27% (P < .0001), and 92% of septic lesions showed negative bacterial cultures. Logistic regression analysis indicated a significant improvement in healing rates (P < .0001), with 80% of patients achieving complete wound closure. Inflammatory markers were reduced, and tissue regeneration was enhanced.

OOT demonstrated substantial efficacy in reducing infection, alleviating pain, and promoting wound healing in patients with severe VLUs and DFUs, restoring their healthy, normal limbs. These findings support

Continued on page 14

Introducing

THE MOORE BALANCE BRACE

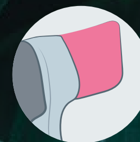
SIGNATURE EDITION

Developed by Jonathan Moore, DPM, in collaboration with Orthotica Labs, the *MBB Signature Edition* will help seniors maintain and prolong independent living by reducing their risk of falling.

Compelling new features, enhanced patient outcomes...

Faithfully captures the contour of the arch

Rearfoot extrinsic post for enhanced stability

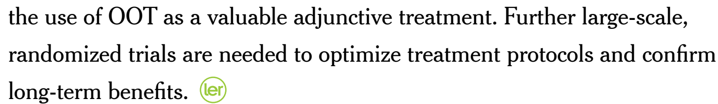

Single Velcro® closure for easier donning & doffing

Premium leather inside and out for superior durability and comfort

If Dr. Moore hasn't signed it,
it's not an MBB

Call to order or for more information.
888.895.1305
orthotica.com/learn-more

Continued from page 12

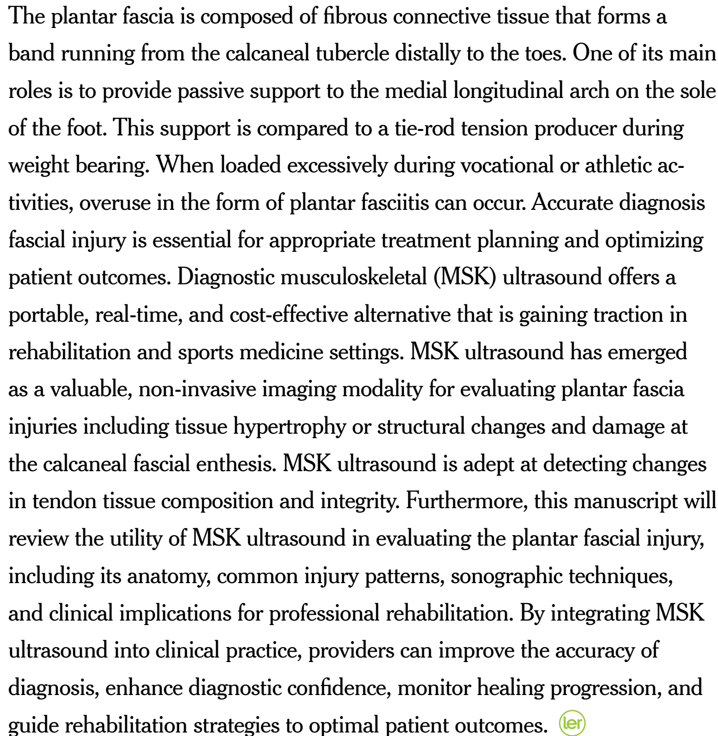


the use of OOT as a valuable adjunctive treatment. Further large-scale, randomized trials are needed to optimize treatment protocols and confirm long-term benefits.

***Source:** Masiello G, Franzini M, Tirelli U, et al. Successful treatment of severe venous leg ulcers and diabetic foot ulcers using ozone. J Vasc Surg Venous Lymphat Disord. 2025;13(6):102278. doi: 10.1016/j.jvsv.2025.102278. Use per CC BY.*

DIAGNOSTIC MUSCULOSKELETAL ULTRASOUND FOR PLANTAR FASCIA

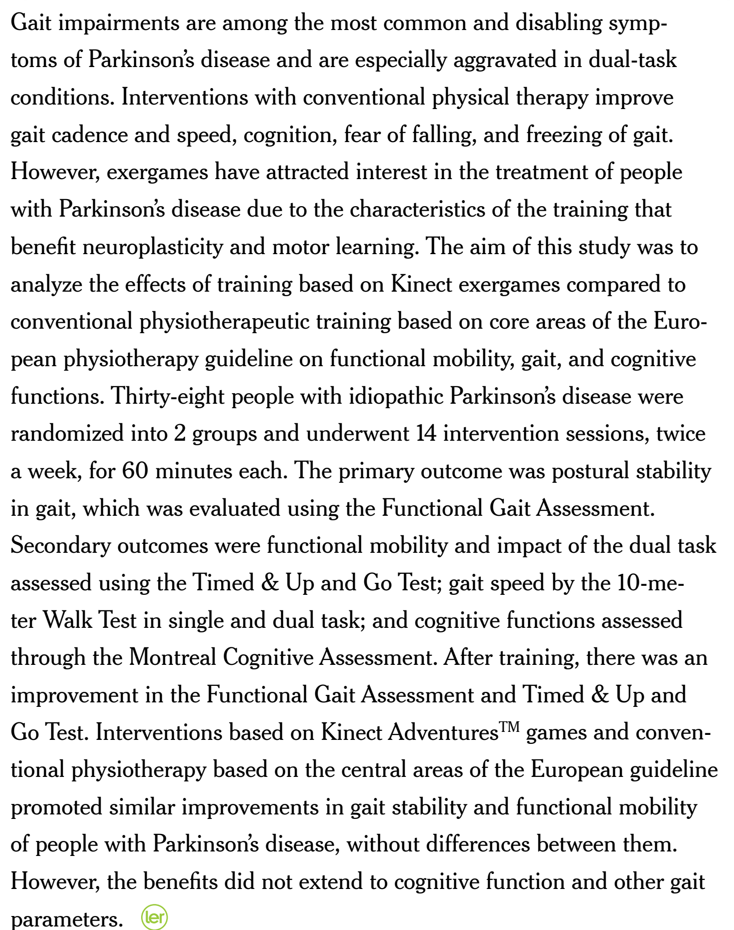
Figure 1. Figure 1A: Transducer Placement on Plantar Fascia in Long Axis (LAX) To obtain a LAX view of the plantar fascia, the transducer is placed longitudinally along the plantar surface of the foot, starting at the medial calcaneal tuberosity and extending distally toward the metatarsal heads. Figure 1B: Transducer Placement on Plantar Fascia in Short Axis (SAX) To obtain a SAX view, maintain the same patient positioning and rotate the transducer perpendicular to the fascia's fibers, typically just distal to the calcaneal insertion.



The plantar fascia is composed of fibrous connective tissue that forms a band running from the calcaneal tubercle distally to the toes. One of its main roles is to provide passive support to the medial longitudinal arch on the sole of the foot. This support is compared to a tie-rod tension producer during weight bearing. When loaded excessively during vocational or athletic activities, overuse in the form of plantar fasciitis can occur. Accurate diagnosis fascial injury is essential for appropriate treatment planning and optimizing patient outcomes. Diagnostic musculoskeletal (MSK) ultrasound offers a portable, real-time, and cost-effective alternative that is gaining traction in rehabilitation and sports medicine settings. MSK ultrasound has emerged as a valuable, non-invasive imaging modality for evaluating plantar fascia injuries including tissue hypertrophy or structural changes and damage at the calcaneal fascial enthesis. MSK ultrasound is adept at detecting changes in tendon tissue composition and integrity. Furthermore, this manuscript will review the utility of MSK ultrasound in evaluating the plantar fascial injury, including its anatomy, common injury patterns, sonographic techniques, and clinical implications for professional rehabilitation. By integrating MSK ultrasound into clinical practice, providers can improve the accuracy of diagnosis, enhance diagnostic confidence, monitor healing progression, and guide rehabilitation strategies to optimal patient outcomes.

***Source:** Manske R, Wolfe C, Page P, Voight M. Diagnostic musculoskeletal ultrasound in the evaluation of the plantar fascia. Int J Sports Phys Ther. 2025 1;20(7):1091-1096. doi: 10.26603/001c.141177*

EXERGAME PROGRAM IMPROVES GAIT IN PEOPLE WITH PARKINSON'S DISEASE



Gait impairments are among the most common and disabling symptoms of Parkinson's disease and are especially aggravated in dual-task conditions. Interventions with conventional physical therapy improve gait cadence and speed, cognition, fear of falling, and freezing of gait. However, exergames have attracted interest in the treatment of people with Parkinson's disease due to the characteristics of the training that benefit neuroplasticity and motor learning. The aim of this study was to analyze the effects of training based on Kinect exergames compared to conventional physiotherapeutic training based on core areas of the European physiotherapy guideline on functional mobility, gait, and cognitive functions. Thirty-eight people with idiopathic Parkinson's disease were randomized into 2 groups and underwent 14 intervention sessions, twice a week, for 60 minutes each. The primary outcome was postural stability in gait, which was evaluated using the Functional Gait Assessment. Secondary outcomes were functional mobility and impact of the dual task assessed using the Timed & Up and Go Test; gait speed by the 10-meter Walk Test in single and dual task; and cognitive functions assessed through the Montreal Cognitive Assessment. After training, there was an improvement in the Functional Gait Assessment and Timed & Up and Go Test. Interventions based on Kinect Adventures™ games and conventional physiotherapy based on the central areas of the European guideline promoted similar improvements in gait stability and functional mobility of people with Parkinson's disease, without differences between them. However, the benefits did not extend to cognitive function and other gait parameters.

***Source:** Nuvolini R, Silva K, Freitas T, Doná F, Torriani-Pasin C, Pompeu J. Exergame-based program and conventional physiotherapy based on core areas of the european guideline similarly improve gait and cognition in people with parkinson's disease: randomized clinical trial. Games Health J. 2025;14(5):358-368. doi: 10.1089/g4h.2024.0116.*

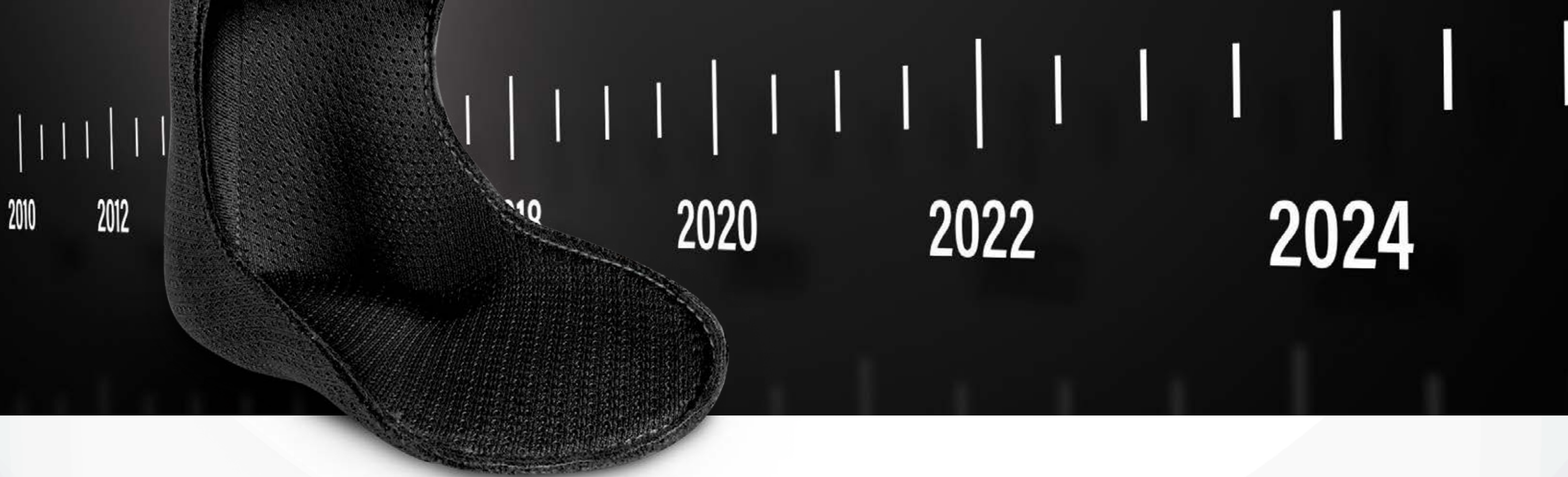
AZafo™ ARIZONA

An OHI Company

ARIZONA BALANCE BRACE

OVER A DECADE

OF POSITIVE PATIENT OUTCOMES



Arizona Balance Brace: Podiatrists' top choice for treating balance issues

With over a decade of success, the **Arizona Balance Brace** is the only balance brace with a proven track record of impacting **tens of thousands of patients' lives.**

Scan to learn more about how to

Implement a Fall Prevention Program in your practice

The OHI Family of Brands

Failed Forefoot MIS Surgery: What Can You Do to Prevent This from Happening

By Raquel Sugino, DPM, MS, FACFAS

Navigating Minimally Invasive Foot & Ankle Surgery: Key Insights for Clinicians

Minimally Invasive Surgery (MIS) in foot and ankle continues to evolve, offering new avenues for patient care. This discussion delves into the nuances of MIS, particularly concerning bunion correction and common challenges.

Understanding the Learning Curve and Complication Rates

For those venturing into or deepening their expertise in MIS, understanding the learning curve is paramount. While historically mastering bunion correction required 60–70 cases in 2017, to 40 cases in 2022, advancements like third-generation bunion correction with 2 screws, stable fixation, and jigs have significantly reduced this learning. It is important to note that these learning curves are not directly correlated to complication. Clinicians should be reassured that taking more time or X-rays during an operation does not necessarily lead to higher complication rates.

Mastering Bunion Correction: Preventing Recurrence

Every procedure carries inherent risks. Bunion recurrence is a significant concern, with reported rates ranging from 0.9% to 1.8%. A colleague Dr. David Gordon boasts a remarkable 0.9% recurrence rate, performing thousands of bunions since 2013. Key factors influencing recurrence rates include:

- **Hallux Valgus Angle (HVA):** Incomplete deformity correction of the HVA and its loss at 6 months are high-risk factors for recurrence. Interoperatively, aim for a "straight as an arrow" HVA; consider an Akin or lateral release if necessary.
- **Sesamoid Position:** Recurrence is consistently correlated with sesamoid position across multiple studies. Loss of sesamoid reduction can lead to recurrence.
- **Intermetatarsal Angle of the Proximal Fragment (IAPF):** Increasing the first intermetatarsal angle of the proximal fragment by maximizing the shift helps lock up the first tarsometatarsal joint, particularly in cases of hypermobility, thereby lowering the risk of future recurrence.

Minimizing Nerve Injury

Nerve injury, though rare (0.9%), underscores the need for meticulous technique. The dorsal lateral digital nerve is particularly vulnerable, located at the 2 o'clock or 10 o'clock position depending on the foot. When performing minimally invasive lateral releases or inserting a burr for medial neck osteotomies, always know your anatomy. Pivot your hand with the wrist through the small incision (2–3mm) rather than moving your arm up and down to avoid enlarging the incision and damaging surrounding anatomy. For burr insertion, the approach should be medial, not dorsal medial, or through well padded tissue.

Optimizing DMMOs

Distal Metatarsal Osteotomies (DMMOs) aim to elevate and proximally translate the metatarsal head. However, transmetatarsal transfer, where un-osteotomized lesser rays become more prominent, is a risk (2.9%). To mitigate this, consider these surgical tenets:

- **Osteotomy Technique:** A 45-degree cut with a 13x2 mm burr, performing a dorsal distal to proximal plantar osteotomy, and maintaining an extracapsular approach are crucial for proper healing.
- **Addressing Multiple Rays:** For pain under the second and third metatarsals, consider cutting the second, third, and fourth metatarsals simultaneously. The intermetatarsal ligaments connect these rays, allowing them to move better as a unit and preventing transfer metatarsalgia. This principle can also apply to offloading diabetic ulcers.
- **Managing Shortening:** While a 2 mm burr can cause an average shortening of 5.1 mm and a plantar translation of 2.8 mm (as the head tends to dive down) when a MICA is utilized to the first metatarsal, increasing the cut angle by 10 degrees more distally can prevent excessive shortening of the first ray.

Crucial Post-Operative Care and Preventing Complications

Post-operative management is as critical as the surgery itself.

- **Dressings:** For lesser metatarsal osteotomies, dressings are paramount for

This article is a summary of Dr. Sugino's presentation, "Failed Forefoot MIS Surgery: What can you do to prevent this from happening?" from the 2025 APMA Surgical Complications Virtual Seminar on January 18, 2025. To view the full presentation with questions and answers—and see the agenda for the program, visit https://apmasurgical.lerexpo.com . Continuing education credits are available for this and many of the lerEXPO programs.

Complications of Percutaneous Forefoot Surgery

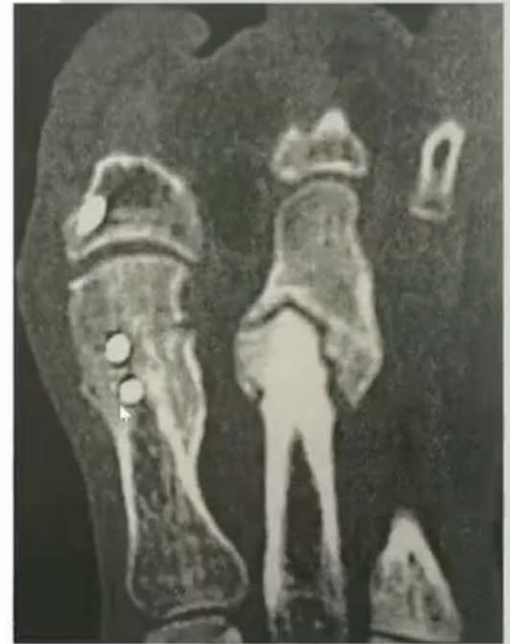
Thomas Bauer and Olivier Laffenêtre

© Springer Nature Switzerland AG 2023
C. Cazeau, Y. Stiglitz (eds.), *Percutaneous and Minimally Invasive Foot Surgery*,
https://doi.org/10.1007/978-3-030-98791-6_35

Distal Metatarsal Minimally Invasive Osteotomy (DMMO)

Transfer Metatarsalgia:

- For surgery on lateral rays, transfer metatarsalgia reported in 2.9% of cases after DMMO.
- Metatarsalgia of 4th ray especially common after DMMO of 2nd, 3rd. **(14)**



Non-union 2nd met on CT @Thomas Bauer 2015

stabilization, unlike bunions with internal fixation. A post-operative X-ray after dressing application ensures proper toe and metatarsal alignment and also allows for any adjustments to alignment as needed for up to 3 weeks.

- **Hematoma Management:** Some surgeons utilize sterile strips instead of sutures for portal closures, allowing for hematoma drainage, which is generally reduced by the absence of a tourniquet.
- **Float Toe:** This common complication can be effectively mitigated with a P1 osteotomy. This quick hammertoe procedure involves a plantar approach, creating a small wedge at the base of the proximal phalanx (or middle phalanx), and reducing the bone to plantarflex the toe at this bone level. It avoids the need for tendon transfers or large incisions.
- **Non-Union & Weightbearing:** Non-union rates are low (0.4%). The importance of immediate post-operative weightbearing (Wolff's Law). Stress on bone encourages bone formation, and delayed union often stems from insufficient weightbearing. For asymptomatic non-unions of lesser rays (rare at 0.1%), revision is not recommended before 18 months.
- **Burr Temperature Management:** Burrs can get hot enough (50 degrees Celsius for over a minute) to permanently burn bone. Strategies to prevent this include:
  - Taking a 2-second break every 20 seconds to cool the burr.
  - Thorough irrigation, even with a saline bulb, during bone work. (Chilled saline is not significantly better than room temperature saline).
  - Using a low-speed, high-torque setting (eg, 6,000 RPM).
  - Regularly cleaning burr flutes from bone debris to maintain sharpness of burr and effective cutting.
  - If skin burn occurs intraoperatively, reapproximate good skin to good skin by excising burned tissue to prevent dehiscence.
- **Arterial Flow:** The arterial supply to the metatarsal head is planter lateral. Avoid scooping inferiorly to the metatarsal neck during bone cuts to protect these vital neurovascular structures.
- **Infection Rates:** MIS procedures generally have lower infection rates (0–1.6%) than open surgery, often presenting as superficial infections requiring oral antibiotics.

A Case Study in Resilience and Revision

A challenging case highlighting the importance of patient adherence features a patient who 2 weeks post-op from a successful MIS bunion correction, wore 2-inch heels for a high school reunion, resulting in 63% increased forefoot pressure. This may have led to an avascular

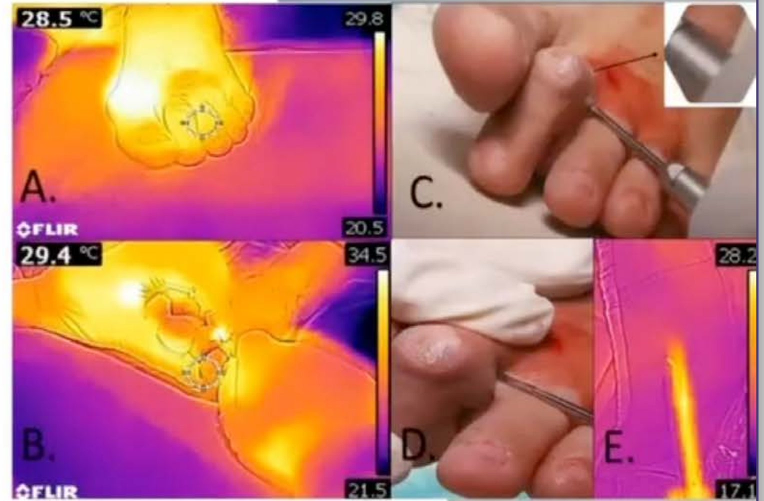
Continued on page 18

Continued from page 17

Comparing the Temperature Effect of Dedicated Minimally Invasive Motor System to the Discontinuous Use of Rotatory Burrs in the Correction of Hallux Valgus

Dror Robinson [1], Eval Heller [1], Mustafa Yassin [1]
Foot Ankle Spec. 2020 Dec;13(6):478-487. doi: 10.1177/1938640019890225.

- **Thermal injury risk ↑: >20 seconds of burr use**
- Strategies to reduce bone temperature:
  - **Irrigation** of the burr shaft
  - **No tourniquet** (8,9)
  - **Low speed, high torque burr** (6,000 RPM)
- **Max usage of burrs should be 5 cycles of 20 seconds each.**
- **Low speed high torque** systems reduce intra-op temperatures (10)
- **Rotation speed** should be maximum of 10,000 – 15,000 rpm. (**6,000 rpm** preferred)
- High speed increases risk of superficial skin burns, and bone necrosis.

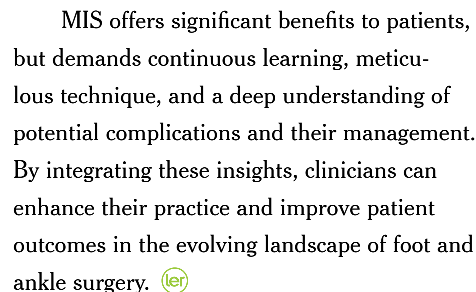


non-union and gapping. Despite the patient being asymptomatic, swelling indicated a long-term issue. A revision was performed using a posterior-superior lateral wall calcaneal autograft to address the bone loss, reinforced with dual dorsal and medial plating, and enforced strict non-weightbearing for 3 months. This meticulous approach led to solid fusion, resolution of pain, and preserved range of motion to the first metatarsal phalangeal joint.

Key Takeaways for the MIS Clinician

A comprehensive overview underscores several crucial principles for clinicians embracing MIS:

- **Know Your Anatomy:** It is the foundation of safe and effective surgery.
- **Master Open Surgery Too:** Not all cases are amenable to MIS; proficiency in open techniques is essential.
- **Practice Relentlessly:** Utilize saw bones, cadaver labs, and seek opportunities for peer-to-peer visits. Industry support can provide invaluable, free learning opportunities.
- **Believe in the Process:** Trust Wolff's Law and your surgical principles to achieve optimal outcomes.



MIS offers significant benefits to patients, but demands continuous learning, meticulous technique, and a deep understanding of potential complications and their management. By integrating these insights, clinicians can enhance their practice and improve patient outcomes in the evolving landscape of foot and ankle surgery.

Dr. Sugino is a fellowship-trained foot and ankle surgeon specializing in comprehensive reconstruction of the foot and ankle. She is board certified in foot and reconstructive rearfoot/ankle surgery by the American Board of Foot and Ankle Surgery (ABFAS). She has been very active in research throughout her training, and she has multiple awards for her work. She is a speaker at many conferences around the country, and she is an active member of the American College of Foot and Ankle Surgeons (ACFAS) and the American Microsurgical Orthoplastic Society (AMOS).

EXPLORE MORE. ADVENTURE MORE.

The lightweight and breathable Expedition orthotic is engineered for repeated impact and shock absorption.

Start providing Footmaxx orthotics today!

1.800.779.3668

Footmaxx™

Footmaxx.com/get-started

Early Assessment and Intervention for Acquired Adult Flatfoot and PTTD

By Dr. James McGuire DPM, LPT, LPed, FAPWHc

Early assessment and intervention of acquired adult flatfoot, particularly concerning Posterior Tibial Tendon Dysfunction (PTTD) is essential. I'll be discussing proactive management, emphasizing the importance of early intervention, comprehensive foot assessment, and the strategic application of orthotic devices to prevent the progression of PTTD and improve long-term patient outcomes.

Proactive Intervention and Biomechanical Balance

A significant failure in current practice is that a lot of the time we fail to warn asymptomatic biomechanically imbalanced people of the risk of PTTD or offer preemptive orthotic intervention. Early intervention is key, even in asymptomatic individuals, by assessing foot and ankle alignment and considering family history of foot and ankle pain we can more accurately access the likelihood of future issues and treat them before they begin. The underlying philosophy is to balance the foot to prevent future pathology, rather than waiting for pain and dysfunction to develop.

Evolution of PTTD Classification Systems

The historical progression of PTTD classification systems, emphasizing their shift from purely tendon-focused to more comprehensive biomechanical models are as follows:

- **Johnson and Strom (1989):** Primarily focused on tendon and tendon pathology, categorizing stages based on swelling and tenderness. A key critique is its oversimplification of Stage 2 and the mistaken assumption of no instability in Stage 1. It failed to account for subtalar, lateral column, and medial column instabilities that often precede rigid deformity.
- **Myerson's Classification:** Incorporated a broader range of deformities, including hindfoot valgus, midfoot collapse, and forefoot abduction/adduction. This represented a move toward recognizing the resultant structural changes from tendon pathology.
- **Paspula's Triple Classification:** This is presented as a more advanced and significant classification, focusing on foot types (planus, normal, cavoid) and stages of ligamentous laxity and reactivity. It emphasizes that pain often stems from ligament and soft tissue stresses on the nerves within those soft tissue structures due to laxity and stretching. Subtalar ligament laxity (Stage 0) can arise from anatomical variation, constant pronation stress, or unaddressed minor injuries (eg, ankle sprains that heal with increased flexibility).
- **Zonal Classification (U, A, B, C, D):** This further refines the Paspula classification by correlating foot type with specific zones of deformity progression (eg, Zone B indicates hindfoot valgus and subtalar instability, Zone D signifies dorsiflexed medial column and abducted forefoot).

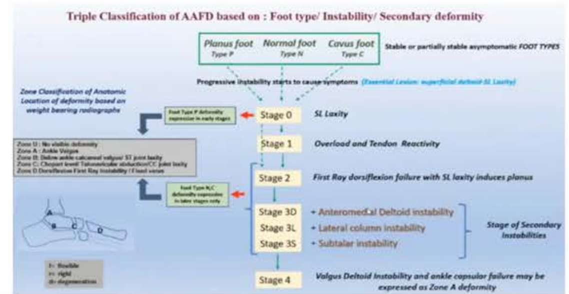
Current Theories of Foot Function and Orthotic Design

Theories that underpin foot function and orthotic prescription and highlight the shift toward a more dynamic and pain-focused approach are:

- **Root Neutral Theory (Foot Morphology Theory):** A structural theory focusing on inherited planar positions (eg, forefoot varus/valgus) and their compensatory motions. This historically led to precise mathematical calculations for orthotic angles.
- **Dananberg's Sagittal Plane Facilitation:** Emphasized the importance of medial column function and plantar fascial tightening for arch restoration.
- **McPoil and Kirby's Tissue Stress Theory:** This theory is a significant departure, focusing primarily on reducing the stresses to the point where the patient has no pain and then allowing them to function. It suggests that orthotics may not always need to restore complete neutral alignment and can sometimes be temporary and based on pain.
- **Whitney's Triplane Balance Theory (Active Structural Control):** Advocates for orthotics that enable the foot to restore itself using normal neuromuscular functions, minimizing the need for excessive muscle action or stress on tendons. This aligns with the idea of achieving dynamic stability.
- **Glaser's MASS Theory (Arch Supination Stabilization):** Uses calibrated leaf springs

This article is a summary of Dr. McGuire's presentation, "Early Assessment and Early Intervention of Acquired Adult Flatfoot to Prevent Future PTTD" from the 2024 Conservative Approach to PTTD held May 11, 2024. To view the full presentation with questions and answers—and see the agenda for the program, visit https://pttd.lerexpo.com/en/. Continuing education credits are available for this and many of the lerEXPO programs.

Zonal classification based on the anatomic location of the deformity



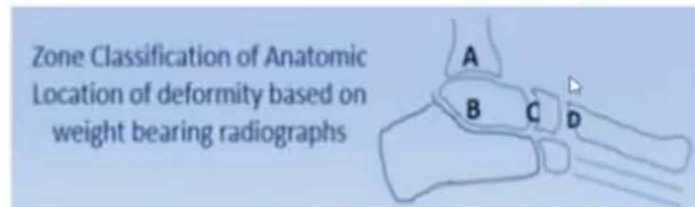
Zone U: Unidentifyable: **reflects no visible deformity**

Zone A: Ankle valgus subluxation

Zone B: Below ankle: Hindfoot valgus (function of TN failure and first ray failure and then subtalar stability)

Zone C: Chopart level deformity (Talonavicular abduction deformity and CC joint instability: both lead to transverse plane deformity)

Zone D: Dorsiflexed medial column



to oppose postural changes, focusing more on the effect than rigid structural correction.

- **MacConaill-Sarrafian Twist the Plate Theory:** Focuses on the winding and unwinding of the twist of the plate within the foot.

Blending these theories gives patients the best outcomes. The importance of restoring the foot to a neutral alignment, when possible, even while acknowledging the tissue stress theory's focus on pain reduction.

The Critical Role of the Subtalar Axis and Kirby Skive Orthoses

A central and most important concept presented is the subtalar axis and its manipulation through Kirby Skive orthoses.

- **Subtalar Axis:** This anatomical axis shifts medially during pronation and laterally during supination. If the axis is medially deviated in a pronated foot, common orthotic interventions like forefoot varus wedges or increased arch height will only *increase pain and pronation* by applying force ineffectively.
- **Kirby Skive Orthosis:** This device, initially developed by Blake and refined by Kirby, involves a marked inversion of the rearfoot heel seat. Its purpose is to control the foot way in the back early in the gait cycle. The Kirby Skive grabs the heel very early in the gate cycle. As soon as you hit the ground, your foot is inverted and prevented from going past that position of balance or that center axis of balance in the shoe.

Working with my mother's severe PTTD, which was resolved only after incorporating a 50-degree Kirby Skive in her orthotic, despite initial hesitation and conventional wisdom. This dramatic success underscores my belief in aggressive rearfoot inversion.

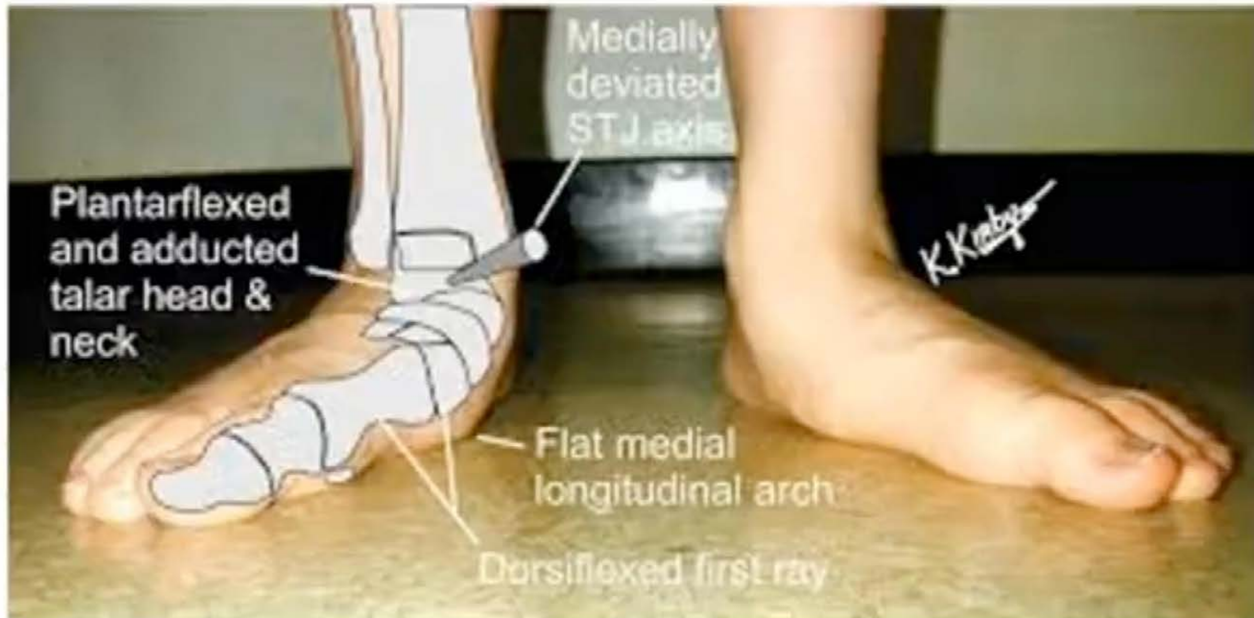
- **Measurement and Modification:** The Kirby Skive is measured in millimeters of cut into the plaster cast, which correlates to angular correction of the heel seat. McGuire Kirby Skive modification : For every 2 degrees of calcaneal eversion, we would add 10 degrees of Kirby Skive to the positive mold. This involves rasping a flat onto the medial calcaneal tuberosity area of the positive mold.
- **Reduction Casting ("Creative Casting"):** This technique involves actively manipulating the foot during casting, often by lightly plantarflexing the first ray and slightly dorsiflexing the hallux, to achieve a more balanced foot position in the cast. This contrasts with Root's neutral position casting.

Balance as the Key to Function

Balance–both structural and dynamic–is crucial for foot function and overall posture.

Continued on page 22

Continued from page 21

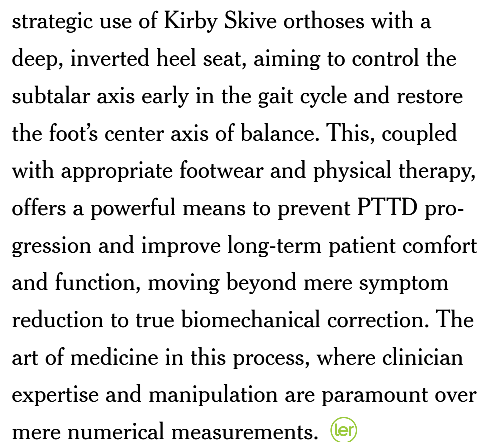


- **Active Structural Control:** Is an engineering term applied to the body, implying the use of neuromuscular control to maintain skeletal alignment. The foot is not a static structure but a "dynamic" one, with skeletal, ligamentous, myotendinous, and neurological control systems working in concert.
- **Center Axis of Balance:** This is ideally located along the second metatarsal, where the body's center of gravity attempts to stay. Imbalances (osseous, myotendinous, etc.) shift these vectors, leading to compensation.
- **Kinetic Chain Reaction:** Imbalances at the foot level can trigger a "big kinetic chain reaction" throughout the body, affecting hips, spine, shoulders, and head, as the body strives to keep the eyes level and maintain equilibrium.
- **Multiaxial Midtarsal Joint:** The midtarsal joint (talonavicular and calcaneocuboid) is described as "instantaneously multiaxial" and "genetically unique," making it highly adaptable but also susceptible to dysfunction when ligaments are weakened or torn due to trauma or degeneration.
- **Digital Reaction Patterns:** Foot imbalance leads to compensatory gripping or shifting of the toes, visible in digital reaction patterns.
- **Restoring Balance with Orthotics:** Orthotics are designed to "restore the balance," not just adjust for fixed angular deformities. The goal is to bring the center axis of balance into alignment. The art of medicine is in this, as precise manipulation during casting can be difficult with static scanning devices.

Treatment Modalities Beyond Orthotics

Customized orthotics are very helpful, but there are other interventions for PTTD:

- **Footwear:** Good supportive footwear with a deep heel cup, supportive counter, and potentially a rocker sole is critical, especially for women who tend to wear less supportive shoes. (There was a surge in PTTD cases during COVID-19 due to increased barefoot or slipper-wearing at home.)
- **Physical Therapy:** Crucial for strengthening tendons once pain is reduced, but patients must remain in a supportive orthosis during rehabilitation.
- **AFOs (Ankle-Foot Orthoses):** A deep heel cup orthosis typically used for children but can be effective for adults with flexible flat feet, especially when coupled with a Kirby Skive.
- **SMOs (Supramalleolar Orthoses):** Extensions of the UCBL above the ankle, used to prevent surgery or osseous intervention.
- **Arizona Brace:** Designed specifically for PTTD but criticized for its bulkiness (difficulty with shoes), unhinged ankle (requiring rocker soles), and often



inadequate foot plate. Primarily for late Stage 2, 3, and 4 PTTD.

- **Richie Brace:** Hinged AFO designed to allow ankle motion and eliminate the need for rocker soles. However, the orthotic component within the Richie brace is often insufficient; it requires a good Kirby Skive deep heel orthosis with a perfectly balanced foot as an adjunct.
- **Aircast/Simple Ankle Braces:** Provide ankle stabilization but fail to address the underlying foot function and pronation, often leaving the PTT still stressed.
- **Crow Boots:** Generally inappropriate for PTTD due to weight, cost, and lack of true weight-bearing relief, reserved for inoperable feet with ruptured tendons.
- **Torch Walker (Total Contact Orthotic Restraining Custom Hybrid):** A fixed-ankle, cosmetically acceptable alternative for severe, inoperable cases with ruptured tendons and pain. Critiqued for often lacking a properly designed rocker.

Conclusion

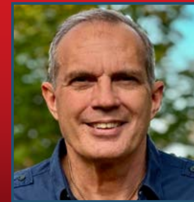
There is a great need for a paradigm shift in PTTD management, emphasizing early assessment and intervention even in asymptomatic individuals with biomechanical imbalances. The core of this approach centers on the strategic use of Kirby Skive orthoses with a deep, inverted heel seat, aiming to control the subtalar axis early in the gait cycle and restore the foot's center axis of balance. This, coupled with appropriate footwear and physical therapy, offers a powerful means to prevent PTTD progression and improve long-term patient comfort and function, moving beyond mere symptom reduction to true biomechanical correction. The art of medicine in this process, where clinician expertise and manipulation are paramount over mere numerical measurements. ler

Dr. James McGuire is the director of the Leonard S. Abrams Center for Advanced Wound Healing and a Professor Clinician Scholar in the Departments of Podiatric Medicine and Biomechanics at the Temple University School of Podiatric Medicine in Philadelphia. His undergraduate degree is from Bucknell University in Lewisburg, PA (1974), and his Physical Therapy Certificate is from the University of Pennsylvania, Philadelphia, PA. (1975) He practiced physical therapy in Philadelphia until 1977 when he entered Podiatric medical school. Dr. McGuire is a board-certified podiatrist and wound care specialist. He has more than 40 years of experience in biomechanics and wound management, has published extensively, and has participated in several research trials involving the diabetic foot and wound healing. Dr. McGuire has lectured both nationally and internationally in the areas of wound healing, diabetic foot management, off-loading, and biomechanics of the at-risk foot.

Orthotics are designed to "restore the balance," not just adjust for fixed angular deformities.

EXPERT OPINION

Funding Cuts Threaten Both the Health of Patients and the Profession



By Géza F. Kogler, Ph.D, CO

Over the course of my career, I have operated at the crossroads of bioengineering and clinical orthotics, a combination that has provided me with a unique perspective on addressing challenges in prosthetics and orthotics.

I collaborated with Georgia Institute of Technology to develop the curriculum for the first Master of Science in Prosthetics and Orthotics program. When that program was sadly discontinued in 2019, the state of Georgia recognized the ongoing need for specialized training, and agreed to transfer the program to Kennesaw State University to help continue this vital work. The idea was to build a nationally recognized regional center of excellence to train clinicians and researchers who could further drive innovation in the field. In my time there, I led efforts in hiring, curriculum design and research initiatives, always with the goal of bridging clinical education with cutting-edge bioengineering research.

At Kennesaw State I also was awarded an NIH research training grant ($1.3 million) designed to attract top STEM degree undergraduates into prosthetics and orthotics research. My aim was to inspire the next generation of scientists to establish a pipeline of innovation in a field with a very limited number of researchers. We recruited students with strong backgrounds in science and math, many of whom were often the first-generation college attendees. The program offered full tuition and stipends, enabling students to focus solely on research and with learning experiences that exposed students to an array of clinical environments. There were also summer boot camps providing hands-on experience in prosthetics and orthotics, allowing students to explore research while gaining practical clinical insights.

Diversity in the program went beyond ethnicity or gender. The mission was based on

iStockphoto.com #490026034

student success and about cultivating a wide array of academic and personal backgrounds, bringing together students with different ways of thinking to foster creative problem-solving. Over time, this diversity began to transform the field.

Considering only 20 years ago the profession was predominantly white males, a surprising major shift occurred when the profession moved to the entry-level master degree and the number of females entering the field skyrocketed. This demographic shift was a great sign for the future of the field, with more women and students from underrepresented groups entering the field. I have witnessed firsthand how diverse perspectives influence patient treatment and research approaches, and I believe such diversity is essential for meaningful innovation.

Unfortunately, the NIH funded program was terminated in May 2025, midway through its funding. The grant was on target to train 32 undergraduates with research skills in biomedical engineering, with a focus on orthotics, prosthetics, rehabilitation and exoskeletons and to prepare them with the skills needed to pursue doctoral degrees. The loss of this special training program is also a loss to an entire generation of students poised to advance the field. The pipeline for research and innovation in prosthetics and orthotics has a significant gap now, and I worry about the impact on patients

who depend on these advancements.

When the grant was terminated, it not only halted my own plans for expanding the Kennesaw State orthotics and prosthetics but also left the first cohort of undergraduate research trainee students without the support and mentorship they had counted on. These were some of the most promising minds, and I worry that this abrupt disruption may discourage them from pursuing research or higher education in the future.

This NIH-funded initiative was intended to cultivate a new generation of innovators in bioengineering, with a focus on prosthetics and orthotics. By connecting students to engineering, rehabilitation, and clinical practice, we hoped to train leaders who could both improve patient care and advance the technology in this field. Losing the funding halted that pipeline at a critical moment. These students brought new ways of thinking that could have reshaped prosthetics and orthotics, and without them, progress slows and patients ultimately lose out.

The demand for prosthetics and orthotics has never been higher. The rise in chronic conditions like diabetes, cardiovascular disease and obesity, coupled with an aging population that lives longer, means more people require prosthetic and orthotic devices to maintain their mobility and independence. While basic orthoses, such as devices for drop foot, have been around for centuries, technological innovations such as integrated sensors and computer-assisted control devices hold the promise of dramatically improved outcomes. Developing these advances requires trained clinicians and researchers, but when research funding is cut, progress stalls, and patients miss out.

Access to prosthetics and orthotics services has been declining for years due to a shrinking workforce. The decrease in the number of trained practitioners could lead to compromised care, no orthotic or prosthetic intervention, and less effective devices and reduced mobility and independence for patients. Every missed opportunity to train a researcher or clinician is a missed chance to improve patient care. When access to orthotist or prosthetist is limited, other allied healthcare professionals will fill the gap which may be an off-the-shelf device "hand-off". An AFO for drop foot is one of the most common scenarios. While a patient did receive care, the question I ask is, "Is that the best we can do?"

The existing workforce is aging, and there are not enough graduates from the existing P&O programs to replace the loss to practitioners expected to retire in the next few years. The gap between the demand for skilled clinicians and researchers and the available supply is alarming. Few individuals are actively engaged in research or training new professionals, so as technology advances, the capacity to develop and apply it diminishes. The NIH-supported model I helped establish was designed to sustain a pipeline of talented students beyond the life of the grant, but with the funding cut, that model has been lost.

Federal funding cuts have consequences beyond individual students. Each trained student represents a potential breakthrough—an innovative device, a new approach to patient care, a future clinician dedicated to keeping patients mobile and independent. Without programs that integrate research with clinical practice, these innovations may never reach those in need. Companies like Hanger Clinic demonstrate how combining research and clinical expertise can be linked to improved outcomes, and business growth, benefiting everyone. But this synergy still depends on a steady pipeline of trained professionals.

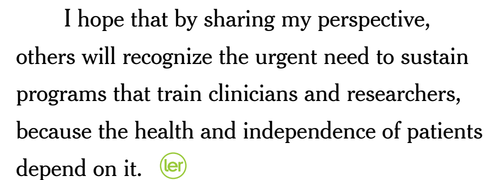
I am committed to creating pathways for students to enter prosthetics and orthotics research and practice. The loss of programs and funding is not just a personal disappointment; it's a societal setback. We risk leaving patients without access to top care, slowing technological progress, and discouraging future scientists and clinicians. Research is about translating discoveries into meaningful improvements in lives.

> I have witnessed firsthand how diverse perspectives influence patient treatment and research approaches.

As I near the later stages of my career, my concern for the future of prosthetics and orthotics remains strong. The need for innovation is urgent, yet the infrastructure to support it remains fragile. Without continued investment from federal sources in training and research, a widening gap will develop between patient needs and available solutions. The talented students who could invent the next generation of bioengineered prostheses and orthoses may never get the chance, and patients will suffer the consequences.

For those outside healthcare and research, the importance of these programs may not be immediately obvious. Every individual values mobility and independence and every patient deserves the best possible care. Limiting funding and training opportunities in prosthetics and orthotics constrains scientific and medical progress. This is not a partisan issue—it is a human one. Supporting these initiatives ensures that new generations can advance the field, develop better devices, and keep patients moving.

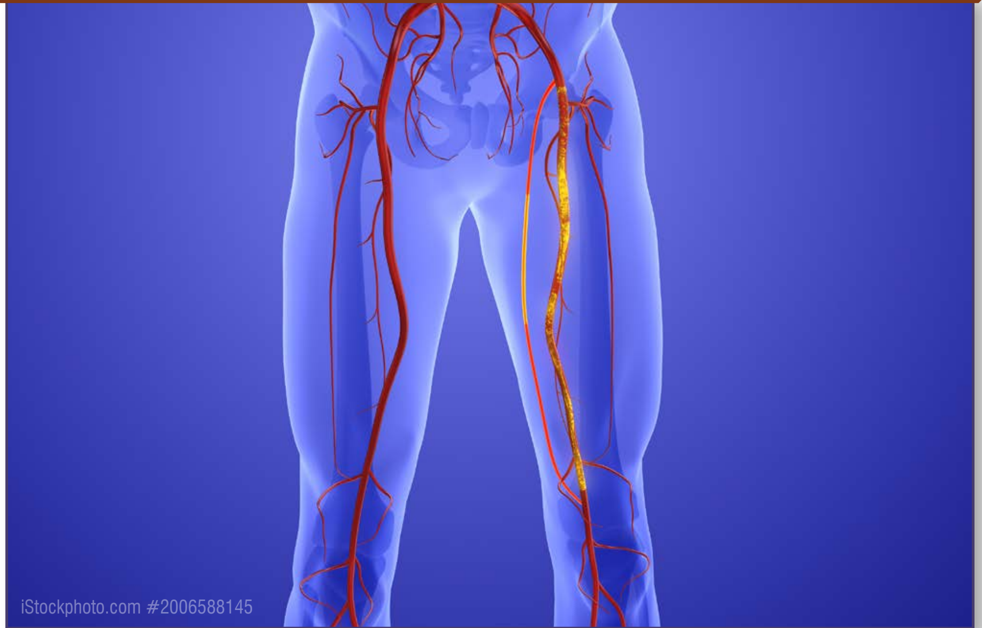
I hope that by sharing my perspective, others will recognize the urgent need to sustain programs that train clinicians and researchers, because the health and independence of patients depend on it.



Dr. Kogler is an independent research scholar based in Greenville, South Carolina. He is the former Program Director for the Master of Science in Prosthetics and Orthotics Programs at Georgia Institute of Technology and Kennesaw State University, respectively. He has an excellent research record with grant funding from the NIH, NSF, DoD and DARPA. His current research interests include: powered exoskeletal systems for rehabilitation, sensing applications for diagnostics and musculoskeletal health, foot/ankle biomechanics, and plantar foot tissue mechanics. Dr. Kogler has received numerous awards for his research in foot/ankle biomechanics from the American Society of Biomechanics, the International Society of Biomechanics and the International Society of Prosthetics and Orthotics. Dr. Kogler also serves on the Editorial Advisory Board for Lower Extremity Review.

The Beginning of a Movement: How CLIF 2025 and the MAPS Initiative Are Shaping the Future of Limb Preservation

By Dr. Laiq Raja, MD, FACC, FSCAI, Interventional Cardiologist and Endovascular specialist, Founder of The Limb Savers Society 501 c(3) Non-profit organization and the CLIF Conference.



Each year, hundreds of thousands of Americans lose a limb due to non-traumatic amputation, most of which could have been prevented. Peripheral artery disease (PAD) and its most severe form, critical limb-threatening ischemia (CLTI), continue to devastate lives, particularly among diabetic, Hispanic, and underserved communities. Yet in El Paso, Texas, a model for change has quietly been building momentum and proving that outcomes can improve when disciplines unite under one coordinated mission.

That model is MAPS: Multidisciplinary Amputation Prevention Services. This is a comprehensive hospital-based/outpatient program designed to bridge specialties, streamline communication, and reduce non-traumatic amputations nationwide. Developed by Dr. Laiq Raja and his multidisciplinary team, MAPS represents nearly a decade of collaboration between vascular specialists, wound-care experts, podiatrists, primary care providers, home health teams, rehabs and many others.

The results have been remarkable. El Paso's amputation rates have remained 10% lower than the national average, decreasing from 13% to less than 3%. This achievement underscores what is possible when systems of care are reimagined around prevention rather than reaction.

Now, the mission is expanding. In 2026, the MAPS program will hit the road, bringing its roadmap for success to hospitals and clinics across the country. The goal is to empower communities to replicate this multidisciplinary model, create early detection pathways, and offer a "last option" approach to limb preservation.

"When you build bridges between vascular, wound care, podiatry, primary care, endocrinology, and rehabilitation," says Dr. Raja, "you do not just save limbs, you restore quality of life and dignity."

This year's Critical Limb Ischemia Fighters (CLIF) Conference, our fourth annual event, will set the stage for this national rollout. Taking place Saturday, December 6, 2025, the conference will welcome more than 200 healthcare professionals, industry partners, and advocates to El Paso for a day of collaboration, CME-accredited learning, and innovation. Registration is now open at www.limbsaverssociety.org/clif2025.

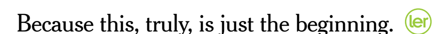
The theme, "Circle of Care: Multidisciplinary Medicine for Limb Salvage and Amputation Prevention," captures the heart of the MAPS mission. Attendees will explore topics ranging from new device technologies and endovascular techniques to data-driven care coordination and racial disparities in limb-salvage outcomes.

"Beyond the lectures and live case reviews, CLIF remains a celebration of progress and a reminder that what began as a local initiative is now a growing national movement," says Alejandra Gutierrez, Outpatient CLI Navigator and Program Liaison. "Our CLI Program, in partnership with Providence Memorial Hospital, has earned the distinction of being the only Joint Commission–accredited Center of Excellence in Peripheral and Vascular Medicine in the United States. The program in El Paso stands as both a destination practice and a beacon of what is possible when collaboration leads the way."

As we prepare for the MAPS national launch, we invite healthcare leaders, hospitals, and clinicians to join us in rethinking the way we approach limb preservation. Together, we can create systems of care that heal faster, connect deeper, and prevent the preventable.

Because every limb saved is a life restored.

Because this, truly, is just the beginning.



Written by Adrianne Rivas, CLI Program Liaison and Alejandra Gutierrez, Outpatient Navigator in collaboration with Dr. Laiq Raja.

Adrianne Rivas

Alejandra Gutierrez

PATIENTS LOVE US. DOCTORS LOVE US.

But don't take our word for it...

"I've been in practice 20 years and sports medicine/orthotics is the mainstay of my practice. I have never seen a lab produce such a great product with such fast turnaround time. Their app is amazing for submitting and tracking orders. Most importantly, my patients LOVE them and many request a 2nd pair.

If you want a lab that actually makes your life easier...Orthotica is it!"

Misty McNeill, DPM,
Weil Foot & Ankle

Jay Segel, DPM
Segel Podiatry

"For over four decades, I have been in private practice on Martha's Vineyard, specializing in biomechanics, orthotics, and rehabilitative podiatric medicine. Orthotica's app scanning, ordering, and tracking modules are intuitive and easy to use for myself and my staff, and the patients find it fascinating.

I have found the products, personnel and practices at Orthotica to be exceptional!"

YOU CAN LOVE US TOO!

To open your Orthotica account or for more information, call:

888.895.1305

orthotica.com

BOOK REVIEW

Brace Yourself: Everything You Need to Know About AFOs After Stroke

By January Shoaf, LER Magazine Editor

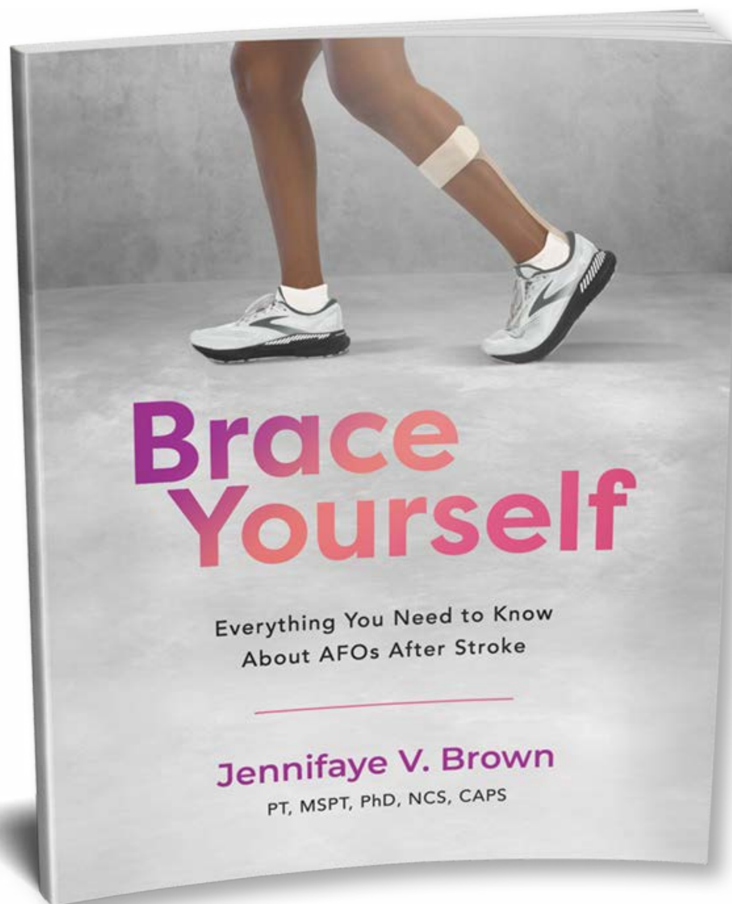
When you're in the middle of a major medical crisis, there can be a lot of information to process. And what if you've never even heard of an ankle foot orthosis (AFO), don't know what it's for, how it works or how to use it. I've been there. (But as LER Magazine's editor, I had heard of an AFO.) I recently had a completely unexpected medical emergency that resulted in an extended hospital stay, physical therapy and a physical therapist handing me an AFO and saying, "Try this." No explanation, not even how to put it on. This is the place that I am coming from in this review. While I did not have a stroke, I can relate to being a bit overwhelmed and uniformed.

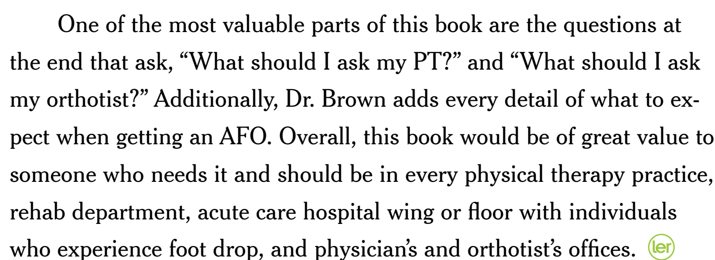
Dr. Brown is a PhD-trained physical therapist who has been board certified as a neurologic clinical specialist by the American Board of Physical Therapy Specialties of the American Physical Therapy Association for 4 10-year terms and is a neuro-developmental treatment (NDT) trained therapist. She has done extensive research with individuals with stroke regarding their experiences with AFOs, which more than qualifies her as an expert on this subject. But more than that, her zeal for wanting every patient to understand what they need to know is evident in every page of her short book. It is perfect for a patient/client, or caregiver to read and really understand all that is being thrown at them. This book is great for other clinicians, such as physical therapists, or those who don't necessarily prescribe or work with AFOs every day to feel more familiar and answer questions for their patients/clients.

The book was laid out well with extensive, yet easy to understand definitions written in a voice made for a lay person. From the very beginning, the title, "Brace Yourself", while completely true, it also shows a bit of comedic relief. Because if you or a loved one has just had a stroke, and you are literally about to use an AFO, you need to 'brace' yourself. There's a lot going on.

Dr. Brown begins simply by defining foot drop, which no one did for me when I was experiencing foot drop, so the sentiment is well received. But she continues by working through the definitions of an AFO and why you would need one. All of the definitions and explanations are perfect for a person with any neurologic or orthopedic diagnosis resulting in foot drop. The specific images the author chose break up the book in a way that makes it an easy read and the images are essential for the reader to really understand exactly what she is explaining.

If I had to point out a weakness in the book, the only possibility I could see is that there might be too much information. I think the table of contents solves this problem. The fact that you can skip around in the book if there are parts that don't relate to you really solves this issue.





One of the most valuable parts of this book are the questions at the end that ask, "What should I ask my PT?" and "What should I ask my orthotist?" Additionally, Dr. Brown adds every detail of what to expect when getting an AFO. Overall, this book would be of great value to someone who needs it and should be in every physical therapy practice, rehab department, acute care hospital wing or floor with individuals who experience foot drop, and physician's and orthotist's offices.

You can order Dr Brown's book from:
Amazon, Barnes & Noble, and jvbneuropt.com/book

Order an ebook (flipbook or PDF) or signed copy at:
jvbneuropt.com/book

SCAN, SUBMIT, SIMPLIFY.

The easiest way to capture, order, and deliver custom orthoses

PROCAST™ OHI
3D SCANNING BY OHI

The Platform Behind the Brands You Trust

OHI ProCAST gives your practice one simple, reliable way to scan and order custom devices. Built to connect directly with our family of brands—**Arizona AFO, The Orthotic Group, Langer Biomechanics, PedAlign, SafeStep, and Apex Foot Health**—ProCAST ensures every scan leads to the quality, precision, and fit our partners are known for.

With OHI ProCAST, you can:

- **Capture Accurate 3D Scans**
  No messy casting materials or shipping costs.
- **Submit Orders Instantly**
  Place and track orders from your iPad or desktop.
- **TrueDepth Scanning**
  Scan using the front-facing cameras from select iPhone Pro or iPad Pro devices.
- **Quicker Turnaround Times**
  Digital submissions mean faster turnaround times and improved outcomes.
- **Rely on Proven Expertise**
  Backed by decades of trust and innovation across our brands.

Ready to Get Started?

Discover how OHI ProCAST can streamline your workflow and improve patient outcomes.
Scan QR Code to learn more!

Now compatible with TrueDepth Scanning for iPhone Pro and iPad Pro!

SPORTS MEDICINE

Combating the Explosion of Type 2 Diabetes with Exercise, Diet and Mental Contentment

By Dr. Robert Weil, DPM and Lawrence Rubin, DPM

According to Robert Weil, DPM, a sports podiatrist and expert in injury-free exercise, we should be advocating for a holistic approach to tackling the rise of type 2 diabetes.

Often called "Dr. Bob" by his followers, he points out that a common contributor to this health crisis is a sedentary lifestyle, which Dr. Bob addresses through his long-standing work with athletes and the general public. The "new medicine," as seen through his lens, moves beyond simple prescription and focuses on empowering individuals to take an active role in their health. The key principles involve eating smarter, keeping active, and prioritizing rest and recovery. Here are the powerful viewpoints he advocates:

1. Eat smarter: Fuel your body for activity

While Dr. Bob is not a nutritionist, his emphasis on sports medicine implies the necessity of proper nutrition to support an active lifestyle and manage diabetes. In his view, what you eat directly impacts your body's ability to perform and recover.

Focus on whole, unprocessed foods. Eating a diet rich in vegetables, lean proteins, and healthy fats provides the necessary fuel without the blood sugar spikes caused by refined carbohydrates and sugars. Plus, prioritize a balanced diet. Combining "good carbs" with healthy fats and proteins can slow digestion, stabilize blood sugar levels, and provide sustained energy throughout the day.

Also emphasize fiber: Nutrient-dense, high-fiber foods, such as beans, nuts, and legumes, are crucial for proper digestion and for preventing sudden surges in blood sugar.

2. Keep moving: Exercise for blood sugar control

Exercise is a cornerstone of Dr. Bob's philosophy.

iStockphoto.com #1014817786

"It is a powerful tool for controlling blood sugar levels and improving overall health," he says. Here are his key exercise recommendations:

- **Move for at least 30 minutes daily:** Studies show a strong link between regular physical activity and blood sugar control. Incorporating movement into your daily routine is critical.
- **Walk regularly:** Walking is a highly effective form of exercise. A post-meal walk can be particularly beneficial for lowering blood glucose levels.
- **Vary your workouts:** Engaging in a variety of physical activities helps prevent injury and keeps things interesting. Options can range from brisk walking to swimming and cycling.

Follow special considerations for senior citizens:

- **Choose low-impact activities:** For older individuals–especially those with existing joint issues, low-impact exercise is essential.
- **Walking:** A simple yet powerful activity that is easy on the joints.
- **Swimming**: Water-based exercises reduce stress on joints and are ideal for those with neuropathy.

Dr. Bob emphasizes the importance of stability. Especially, for seniors, incorporating balance-focused exercises like Tai Chi can reduce the risk of falls, a common complication for individuals with diabetes. He advises his patients to, "Listen to your body." He cautions it is crucial for seniors to start slowly and

gradually increase the intensity and duration of exercise. Medical advice should be sought before beginning any new program.

3. Reduce stress: The importance of rest and recovery

Dr. Bob understands that physical activity is only one part of the equation. Recovery and managing stress are equally vital for maintaining a healthy and balanced life, especially for those managing a chronic condition like diabetes.

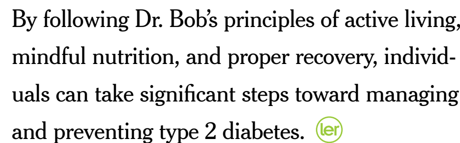
Here are his key recommendations for rest and recovery:

- **Prioritize sleep:** Adequate sleep is essential for the body's repair processes and for managing blood sugar levels effectively.
- **Embrace relaxation techniques:** Practices like deep breathing, meditation, and yoga can help calm the nervous system and lower stress, which can negatively impact blood sugar control.
- **Seek social support:** Talking with friends or family about challenges can help manage the emotional stress of living with diabetes.

A positive outlook can improve overall well-being.

- **Find humor in life:** A positive outlook can improve overall well-being and help navigate life's challenges more effectively.

By following Dr. Bob's principles of active living, mindful nutrition, and proper recovery, individuals can take significant steps toward managing and preventing type 2 diabetes.



A note from Dr. Bob: *Great progress has been made between LER Expo and podiatry that led to getting the word out and collaboration. We've got to get nutrition, lifestyle, childhood obesity, and the lack of exercise FRONT and CENTER to combat the Juvenile Type 2 challenge. Keep your eye out for updates From Dr. Bob.*

Robert A. Weil is a sports podiatrist in private practice in Lisle, Illinois. He hosts "The Sports Doctor," a live weekly radio show on bbsradio.com, or you can visit his website, thesportsdoctorradio.com. His book, #HeySportsParents written with Sharkie Zartman, is available on Amazon.com. Dr. Weil was inducted into the prestigious National Fitness Hall of Fame in April 2019. Find him at thesportsdoctorradio.com.

Lawrence Rubin is the executive director of Lower Extremity Amputation Prevention (LEAP) Alliance and the Chief Executive Officer of FootCare America Networks LLC.

Dr. Robert Weil, DPM

Lawrence Rubin, DPM

The Fortieth Annual
2026 No-Nonsense Seminar
100% Virtual
March 6-8 2026
Up to 25 CECH
North Central Ohio Academy of Podiatric Medicine
Early Bird
$395
NONONSENSE2026.LEREXPO.COM

Choosing the Right 3D Scanning Hardware: What Matters Most

By Dr. Dean Hartley *(Podiatrist & Adjunct Engineering Fellow–University of Queensland)*

As orthotic capture evolves, the next critical variable is scanning technology. Hardware selection isn't just technical, it's clinical. Each modality carries biomechanical implications, and understanding these is essential. In a setting where nuance drives design, hardware must enable precision, not limit it.

The Hardware Landscape: Options and Trade-Offs

Here's a breakdown of the most commonly used systems (see Table 1).

Accuracy: What the Research Tells Us

In a recently published study, our team with Queensland University of Technology, set out to benchmark the accuracy of leading 3D scanning technologies against clinical standards, clarifying their role in best-practice orthotic design.

The implications of this research are both practical and insightful. Our findings indicate that high-cost scanning hardware does not inherently translate to more accurate orthotic devices. Without rigorous training in scanning technique, even the most advanced systems can fall short.

Several Key Findings Emerged:

- No significant differences were found between hardware platforms in terms of scan accuracy and final design output.
- Clinician technique was the most critical variable influencing the quality and usability of the final design file.
- The amount of load placed through the scan was the primary factor contributing to design variability.

Table 1. Options and Trade-Offs

Hardware	Best for	Not Suitable for	Hardware Cost	Pros / Cons
Hand-Held (Structured Light)	Above the ankle orthotics (AFOs, custom braces)	-	$2,000 One-off capital purchase	**Pros**: Reliable for foot-level capture
Laser Bed Scanner	Custom Foot Orthoses (CFO)	Ankle-Foot Orthoses (AFO)	$2,000	**Pros**: Reliable for foot-level capture **Cons**: Limited depth capture; not viable for above-the-ankle devices
iPad and Structured Light Scanner	CFO, UCBL, SMO and AFOs	-	$1,500 (Structure Scanner + iPad)	**Pros**: High-quality scans; versatile **Cons**: Higher initial outlay; requires calibration and setup
TrueDepth Scanning (iPad Pro or iPhone)	CFO and AFO	-	$500-$1500 (iPad Pro – 3rd Gen+ or iPhone X and up)	**Pros**: Most clinicians already own compatible devices; minimal setup **Cons**: Dependent on scanning technique; file quality varies

Building on the theme of democratized access, economic analysis underscores the practicality of 3D scanning in clinical workflows. Comparative evaluations revealed that digital capture methods can reduce procedural costs by up to 80% and time requirements by nearly 85% when compared to traditional plaster casting. These findings highlight not only the efficiency of modern scanning technologies but also their potential to streamline operations and improve accessibility–particularly for clinics operating under resource constraints.[2]

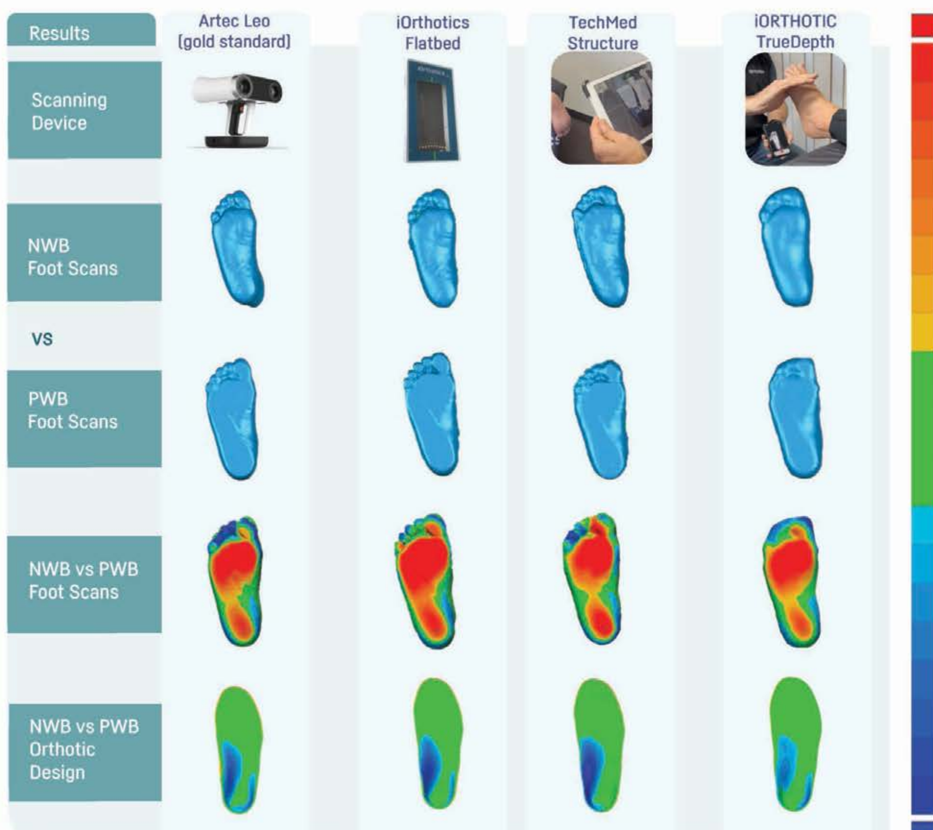


Figure 1: Komal Chhikara, et al. [1]

Taken together, the accuracy and economic data present a compelling case: 3D scanning is not just a technological upgrade—it's a strategic enabler. When paired with sound clinical technique, even modestly resourced practices can deliver high-quality orthotic outcomes with speed, consistency, and cost-effectiveness. This marks a shift in the orthotic landscape, where precision is no longer gated by budget, but unlocked through clinical excellence.

In our final article in this series, we shift focus from hardware to technique–arguably the most critical factor in digital orthotic success. From scan positioning to weight-bearing protocols, we'll explore why mastering scanning technique is the new gold standard in clinical practice.

Dean Hartley is a Podiatrist and healthcare innovator with over a decade of experience in clinical practice, orthotic manufacturing, and allied health leadership. He co-founded Balance Podiatry, iOrthotics globally, and Healthia Limited, a publicly listed allied health organization. As Director, he leads iOrthotics Australia, The Orthotic Factory (Adelaide), iOrthotics USA and Performance Labs (New Jersey), driving advancement in orthotic manufacturing through 3D printing, digital workflows, and scanning technologies.

Dr. Hartley collaborates with leading universities and industry partners, holds an Adjunct Fellowship at The University of Queensland, and co-established the Healthia R & D Hub, advising on tech-enabled healthcare and private sector research.

References

1. Chhikara K, Suresh S, Morrison S, Hartley D, et al. Does scanner choice matter for the design of foot orthosis? Sensors (Basel). 2025 Jan 31;25(3):869. doi: 10.3390/s25030869.
2. Payne C. Cost benefit comparison of plaster casts and optical scans of the foot for the manufacture of foot orthoses. Australasian Journal of Podiatric Medicine. 2007;41(2):29-31. https://www.podscan.com.au/images/downloads/Plaster_Cast_Vs_Scaning_Cost_Benefit.pdf

Wound Care Game Changer

Help More Patients Relieve Plantar Pathologies — Offload In Their Shoes!

Introducing New PressureOFF™ Customizable Offloading Insoles from PediFix®

Reduce Pressure, Friction & Pain in Everyday Footwear

*With the proven 'removable pegs' offloading design you know, PressureOFF™ insoles help prevent, relieve and promote healing of common plantar pathologies — **in ordinary shoes** — for higher compliance and better outcomes.*

If pressure and friction offloading will benefit your patients, get them onto PressureOFF™ Insoles. Order today, request a free Sample Pack, or get more information. This is an offloading innovation with instant benefits for you, your patients and your practice.

Offload —

- Calluses
- Bursitis
- Capsulitis
- Sesamoiditis
- Warts
- Prominences
- Lesions
- IPKs
- Fat Pad Atrophy
- Bone Spurs
- Metatarsalgia
- Sensitive Areas
- Friction Zones
- Diabetic Hot Spots
- Diabetic Ulcers
- Ulcers in Remission
- Wounds
- Surgical Sites
- More

Removable Pegs Unload Targeted Areas

Distribute Weight Away from Sensitive Lesions

Offload Sore Spots to Relieve Pain, Pressure

Choose Plastazote® or Poron® Top Layers

Introductory Trial Sample Pack Offer!

PediFix® Medical Footcare

Yes, I'm interested in PressureOFF™ Insoles for Offloading in patient footwear. Please send me:

PediFix® Medical Footcare

☐ More information

☐ FREE Sample Trial Pack (while supplies last)

Your Name ______________________

Practice Name ______________________

Shipping Address ______________________

City ______________ State _____ Zip ________

Phone ______________________

Fax ______________________

Email ______________________

In our practice, we see approximately ________ (#) patients each week.

My favorite supplier is ______________________

I prefer: ☐ to Dispense ☐ to Prescribe ☐ Patient Direct Order

Mail to: PediFix, Dept. LER822-P, 301 Fields Lane, Brewster, NY 10509

Fax to: 845-277-2851

Please provide all information requested.

*This offer is for healthcare professionals only. Limit one free sample per customer.

To order, get a free sample* or more information, mention code LER822-P

Call: *1-800-424-5561*

Fax: *845-277-2851*

E-mail: *info@pedifix.com*

Return this Coupon to:

PediFix, 301 Fields Lane, Dept. LER822-P, Brewster, NY 10509

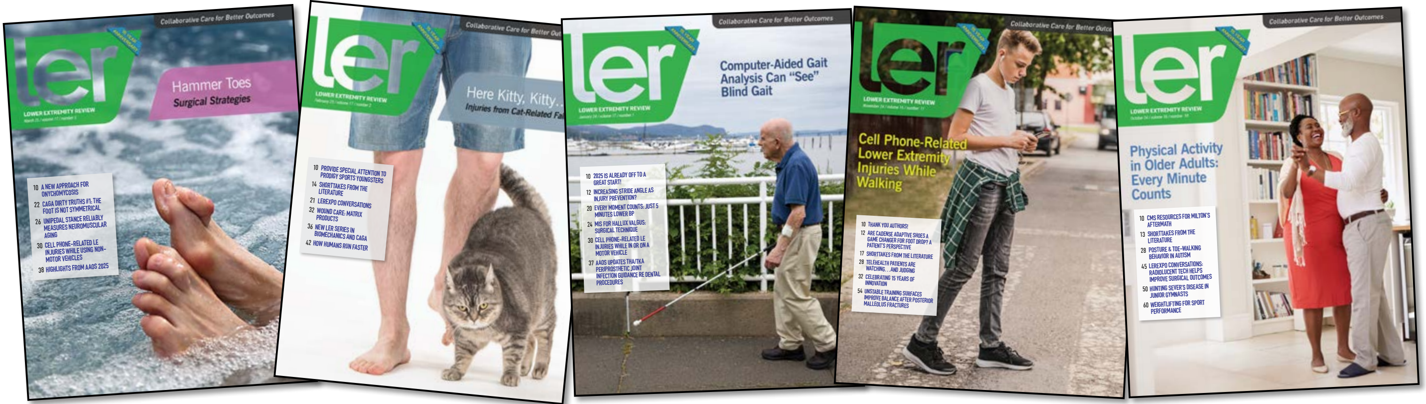
Visit: *www.pedifix.com/t-POIOffloading.aspx*

© 2022 PediFix, Inc. LER822-P

ad index

Please Support our Advertisers… Visit us online at lermagazine.com

Because of them, we are able to provide you with this unique, informative and invaluable magazine!



Arizona AFO 15
877/780-8382 arizonaafo.com

Footmaxx 4-5, 19
800/779-3668 footmaxx.com

lerMARKETPLACE inside front cover
518/221-4042 lerMARKETPLACE.com

lerEXPO NoNonsense Seminar 31
518/221-4042 nononsense2026.lerexpo.com

Pedifix 36
800/424-5561 pedifix.com

OHI 43
877/780-8382 ohi.net/ohiprocast

Orthotica Labs 6,19, 27
888/895-1305 orthoticalabs.com

The Western 41
403/266-6612 xsensor.com

XSENSOR 8
thewestern.org

LOWER EXTREMITY REVIEW
ler

New & Noteworthy

Noteworthy products, association news, and market updates

NEXT-GEN CARBON FIBER INSOLES

AURORRA By ARRIS™ AXA Super Insoles are powered by ARRIS® Composites' breakthrough carbon-fiber technology. The synergy of springy Pebax® foam and a precision-engineered plate delivers all-day performance and fatigue-fighting benefits once reserved for premium athletic footwear. The foam absorbs impact, while the plate guides motion in a more natural-feeling way than traditional carbon-fiber insoles–without the added weight or bulk of legacy materials still commonly used today. Boasting superior energy return, these ultra-light carbon-fiber insoles are built to maximize propulsion through a stiff carbon plate, thick springy foam, and a pronounced rocker shape. As adoption has grown, so have the use cases–runners seeking a less aggressive training option, people managing plantar fasciitis, neuropathy, or big toe pain, and professionals across industries logging long hours on their feet. These insoles are the first of their kind to channel "super shoe" propulsion into a versatile, everyday format.

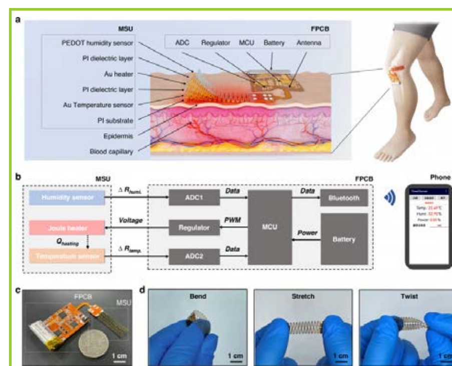
ARRIS Composites
510/730-0067
arriscomposites.com

SMART PATCH SOOTHES ARTHRITIC PAIN WITH HEAT

Researchers from Dalian University of Technology, China, have developed a flexible, wearable thermotherapy system. This multilayered device integrates temperature and humidity sensors with a thin gold-based heater on a stretchable polyimide film. Designed for real-time, automatic use, it responds to environmental cues and body movement, providing personalized thermal treatment for arthritic joints. The system marks a step forward in wearable health technology, addressing the limitations of conventional devices and offering patients a discreet, reliable tool for daily therapy and protection in varying conditions.

At the heart of the system is a kirigami–serpentine structure–an origami-like pattern that enhances flexibility and stretchability. Layered with an Au temperature sensor, Poly (3,4-ethylenedioxythiophene PEDOT)-based humidity sensor, and Joule heater, the device conforms closely to joints, such as knees, and performs reliably during movement. Using real-time data processed by a flexible circuit and Bluetooth-enabled feedback loop, the system can adjust heat output within 1 second, maintaining temperatures with less than 0.1°C variation at 45°C.

This innovation supports multiple applications: programmable on-demand therapy with customized heat cycles; daily thermal protection that automatically activates in cold weather; and moisture control to combat



(a) Schematic illustration of the multifunctional wearable device. (b) Schematic diagram of signal transmission and processing for thermotherapy of arthritis. (c) Image of the fabricated multifunctional wearable device. (d) Demonstrating flexibility and stretchability.

joint-stiffening humidity. On-body tests showed the heater could raise local skin temperature even outdoors, while humidity levels dropped steadily during use. Most strikingly, the team used photoplethysmography (PPG) to measure blood flow and confirmed that thermotherapy via this system significantly boosted local perfusion–an essential factor in pain relief. The design also proved durable through 1,000 plus use cycles, remaining accurate during walking, stretching, and running. By combining high precision with real-world practicality, this soft, wearable system delivers clinical-grade function in a form factor that patients can use every day.

Its modular design, environmental responsiveness, and soft mechanics make it well-suited for integration into clothing, bandages, or therapeutic garments. Additionally, the same sensing-feedback-heating architecture might be adapted for wound care, smart rehabilitation, or ambient-responsive materials.

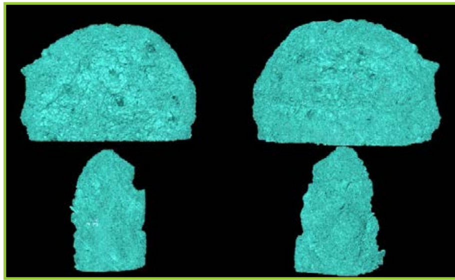
RESORBABLE SYNTHETIC WEDGES FOR OSTEOTOMY PROCEDURES

The Bioactive Pre-contoured Wedge (BPW) is the first fully synthetic, porous bioactive glass solution to come to market and is, specifically, designed with osteostimulation in mind. BPW is the first non-metal wedge that is classified as a device, prioritizing patient safety and

intra-operative effectiveness. It is engineered to correct deformities and fill osseous defects, while providing a fully resorbable, bio-integrative scaffold that promotes and accelerates bone regeneration. Key benefits include: this is the first-to-market bioactive pre-contoured wedge, regulated as a Class II device; the bioactive glass structure claims both osteoconductivity and osteostimulation; it is fully resorbable and replaced by native bone–no need for implant removal; it is more cost-effective than metal implants, with a 5-year shelf life; it is compatible with reconstructive plating and staple solutions.

NovaBone
855/265-8013
novabone.com

BIO(PRINTED) SKIN FOR WOUND HEALING



Three-dimensional mesh of the ADS generated from image segmentation: (a) epidermal interface, (b) dermal interface, (c) left lateral view, and (d) right lateral view.

Researchers from the anatomy and pharmacology departments at the University of Pretoria, South Africa, have addressed the limitations of traditional skin grafting by merging biological sciences with engineering and computational methods to create a solution for wound healing.

"Decellularized acellular dermal scaffolds (ADS) are an alternative to skin grafts and are developed by removing cells from the skin of a donor or an animal; this reduces the potential for rejection," explained Alison Ridel, PhD, of the Department of Anatomy. "Traditional decellularization processes have various limitations, and may produce ADS with altered 3D structure, damaged proteins, and decreased tensile strength." Emerging technologies like 3D bioprinting can overcome the challenges posed by traditional methods.

The research team integrated the 3D bioprinting technology of ADS with advanced technologies like micro-x-ray computed tomography scanning and Amira-Avizo software. This interdisciplinary approach bridges the gap between biological sciences and cutting-edge 3D imaging and bioprinting technologies.

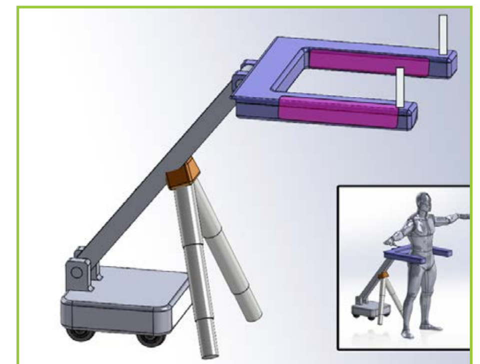
This research on developing artificial dermal substitutes through 3D bioprinting is significant for several reasons. "This improves the healing process for patients with chronic and complex wounds, addressing a critical need in reconstructive medical engineering," Hafiza Parkar, PhD, said. "Secondly, 3D bioprinting enables us to create customizable acellular dermal scaffolds that can be tailored to the specific size, depth and nature of each patient's wound. This personalized approach enhances the efficacy of the treatment and ensures a better fit, potentially leading to faster and more efficient healing…"

ATHLETIC ANKLE BRACE

The Push Kicx Ankle Brace offers superior support for previously injured ankles and is ideal for sports such as soccer, basketball, and volleyball. The athletic ankle brace can also help reduce the risk of sprains in high-intensity activities. Its patented "Prophy-X" strapping system includes a stiffener located on the inside of the ankle and rigid straps that cross over the front and back of the ankle. When the ankle begins to turn inward, these straps engage and pull on the stiffener, which then uses the body's own mass to counter the movement and prevent injury. The stiffener also prevents the ankle turning away from the body, thus stabilizing the ankle in multiple directions. Featuring a very low profile, the brace can be worn comfortably inside a shoe. The forefoot is uncovered, preserving an uninterrupted feel of the ball during play. Made from breathable, quick-drying, machine-washable material.

Canadian Orthopaedic Supply
905/624-6808
shop.canortho.com

ELDERCARE ROBOT HELPS PEOPLE SIT, STAND AND PREVENTS FALLS



In designing E-BAR, the researchers aimed for a robot that provides physical support, prevents falls, and safely and unobtrusively moves with a person. They looked to do away with any harness, to give a user more independence and mobility. Image courtesy of the researchers.

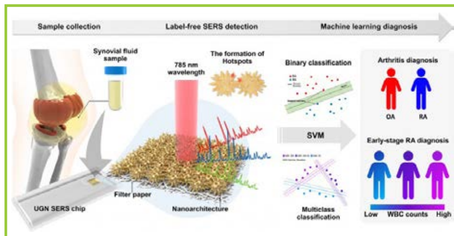
To help address the eldercare challenge, a team of engineers from the Massachusetts Institute of Technology is looking to robotics. They have built and tested the Elderly Bodily Assistance Robot, or E-BAR, a mobile robot designed to physically support the elderly and prevent them from falling as they move around their homes. E-BAR acts as a set of robotic handlebars that follows a person from behind. A user can walk independently or lean on the robot's arms for support. The robot can support the

person's full weight, lifting them from sitting to standing and vice versa along a natural trajectory. And the arms of the robot can catch them by rapidly inflating side airbags if they begin to fall.

With their design, the researchers hope to prevent falls, which today are the leading cause of injury in adults who are 65 and older.

In its current version, the robot is operated via remote control. In future iterations, the team plans to automate much of the bot's functionality, enabling it to autonomously follow and physically assist a user. The researchers are also working on streamlining the device to make it slimmer and more maneuverable in small spaces.

ACCURATE, RAPID ARTHRITIS DIAGNOSIS USING SYNOVIAL FLUID



Schematic illustration of the body fluid-based rapid diagnosis and differentiation technology for arthritis. Image courtesy of KIMS.

A research team from the Advanced Bio and Healthcare Materials Research Division at the Korea Institute of Materials Science (KIMS), in collaboration with Seoul St. Mary's Hospital, Korea, have developed a technology that enables the diagnosis of osteoarthritis (OA) and rheumatoid arthritis (RA) within 10 minutes using synovial fluid.

Although OA and RA may appear similar, they differ in both their causes and treatments, making accurate differentiation at the early diagnosis stage critically important. Until now, diagnosis has relied on X-rays, MRI scans, and blood tests, which are time-consuming, costly, and limited in accuracy.

The research team focused on the differences in the composition of metabolites–byproducts of chemical processes occurring within the body–present in synovial fluid. By analyzing these metabolic differences, they developed a technology capable of distinguishing between OA and RA within 10 minutes, as well as assessing the severity of rheumatoid arthritis.

The research team utilized Surface-Enhanced Raman Scattering (SERS) technology, a phenomenon in which the optical signals of molecules are amplified by several million times. This technology amplifies signals from trace molecules present in synovial fluid and, through a combination of artificial intelligence-based analysis and mathematical algorithms, detects minute substances responsible for arthritis. In addition, the team developed a simple and rapid diagnostic method using a sensor composed of a sea urchin-shaped gold nanostructure formed on a paper surface with high moisture absorption, enabling efficient detection via body fluids.

Tests using this technology were conducted on 120 patients. The results showed that OA and RA could be diagnosed and distinguished with an accuracy of over 94%. Furthermore, the technology achieved over 95% accuracy in determining the severity of RA. These findings demonstrate that the technology not only significantly reduces the time and cost of arthritis diagnosis but also ensures a high level of diagnostic accuracy.

DIABETIC SOCKS WITH INFRARED TECHNOLOGY

Circufiber® socks are designed for people at risk of or living with diabetes. The company's padding technology has been clinically shown to reduce pain, blisters, moisture, and pressures. Circufiber socks feature patent-pending Circulight® infrared (IR) technology to improve circulation in the feet and lower legs. The socks are made from temperature-regulating, moisture-wicking material. The nonrestrictive cuff stays, the low-profile toe seam is non-irritating, and the safety footbed allows easy visibility of bleeding and irritated skin. The All-Day Diabetic socks are designed for people who are looking for clinically proven technology to help their feet and lower legs through the day (and night). The Active Diabetic socks, featuring moderate compression in the arch and tube, are designed for people in pursuit of a healthier, more active lifestyle. The US Food and Drug Administration has designated Circufiber socks as Class 1 Medical Devices and General Wellness Products.

Circufiber
978/955-2783
circufiber.com

STIMULATING THE VAGUS NERVE THROUGH THE EAR TO ALLEVIATE KNEE PAIN

tVNS is already approved by the US Food and Drug Administration to treat some conditions, such as epilepsy and depression, but this clinical trial is the first of its kind in the United States to evaluate the therapy's impact on knee pain. Image courtesy of UTEP

A rehabilitation scientist and his team at The University of Texas at El Paso (UTEP) are exploring an alternative way to alleviate knee pain. In collaboration with Harvard Medical School and Boston University, the team has conducted a pilot trial on a method to treat osteoarthritis (OA)-related knee pain by stimu-

lating the vagus nerve through the ear.

One component of the central pain mechanisms is the vagus nerve, said Kosaku Aoyagi, PT, PhD, an assistant professor of physical therapy and movement sciences in the UTEP College of Health Sciences. The nerve plays an important role in the parasympathetic nervous system, which controls the body's rest and digest function, and is countered by the sympathetic nervous system, which manages the body's response to stress and danger. "The current evidence suggests that individuals with OA knee pain have an imbalance of sympathetic versus parasympathetic activity in the body, which can cause pain. By stimulating the vagus nerve, we hypothesized that our treatment may rectify this imbalance," he said.

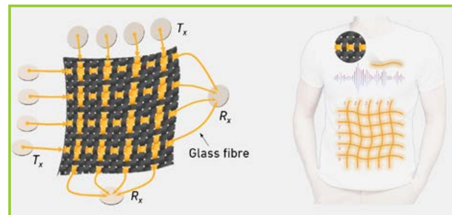
Aoyagi's pilot study tested a treatment called transcutaneous auricular vagus nerve stimulation (tVNS) on 30 individuals with knee pain. Each study participant was treated with a tVNS device for 60 minutes. The device works by resting on the ear and sending a pulse to the auricular (ear) branch of the vagus nerve. Overall, 11 out of 30 participants with knee OA felt a noticeable difference in their pain levels after receiving the treatment.

MISMATCH SHOE SIZING PROGRAM

New Balance has officially launched a mismatch sizing program for the Made in USA Fresh Foam 1540v4, allowing customers to purchase 2 different shoe sizes (left and right), or even a single shoe–ideal for individuals with disabilities, limb loss, or foot size discrepancies. The 1540v4, which holds the American Podiatric Medical Association Seal of Acceptance, blends plush Fresh Foam cushioning with ROLLBAR technology for top-tier stability and comfort. With a breathable mesh upper, dual insert customization, and now a tailored sizing experience, this is a running shoe that supports people exactly as they are. It's a small detail with a big impact, making one of the company's most supportive and premium models more inclusive than ever before.

New Balance
800/595-9138
newbalance.com

SMART TEXTILES USE ACOUSTIC WAVES TO PRECISELY MEASURE TOUCH, PRESSURE, MOVEMENT



The glass fibers are woven through the fabric at regular intervals (left). A transmitter (T) passes acoustic waves through the glass fibers, while the receiver (R) measures the waves at the other end. Integration of SonoTextiles for creating smart T-shirts (right). Image courtesy of Yingqiang Wang / ETH Zurich.

Smart textiles developed by researchers at ETH Zurich, Switzerland, use acoustic waves and glass fibers to help make precise measurements. They are light, breathable, easy to wash, and inexpensive, and offer great potential for medicine, sports and everyday life.

The researchers call their development SonoTextiles. They have transformed normal fabrics into smart sensors that react to touch, pressure, and movement. "While research has already been conducted into smart textiles based on acoustics, we are the first to explore the use of glass fiber in combination with signals that use different frequencies," explained doctoral student and researcher Yingqiang Wang.

The researchers have woven glass fibers into the fabric at regular intervals. At 1 end of each glass fiber is a small transmitter that emits sound waves. The other end of each of the glass fibers is connected to a receiver that measures whether the waves have changed. Each transmitter works at a different frequency, meaning it requires little computing power to determine which fiber the sound waves have changed on. Previous smart textiles often struggled with data overload and signal processing issues, since each sensor location had to be evaluated individually.

When a glass fiber moves, the length of the acoustic waves passing through it changes, as they lose energy. In the case of a t-shirt, this can be caused by body movement or even breathing. The researchers have shown that their concept works in the lab.

In the future, SonoTextiles could be used in a variety of ways: as a shirt or t-shirt, they could monitor the breathing of asthma patients and trigger an alarm in an emergency. In sports training and performance monitoring, athletes could receive real-time analysis of their movements, to optimize their performance and prevent injuries. The textiles also have potential for sign language: gloves with this technology could simultaneously translate hand movements into text or speech. They could also be used in virtual or augmented reality environments.

Exercise is Medicine

The new global exercise guidelines for healthy longevity in older adults are here. With exercise recommendations to address >14 chronic diseases, adverse outcomes, and geriatric syndromes including: falls, cancer, dementia, type 2 diabetes, depression and anxiety. A key focus is the need for personalized exercise prescription and translating the evidence to practice. “The ultimate goal is enhanced quality of life, regardless of age or initial state of fitness or frailty.”

ARTHRITIS: **Low-impact exercises** and ensure sufficient activity to manage weight in obese individuals

CANCER: **RT with dietary interventions** to address muscle loss and reduce cancer cachexia

COPD: Integrate **RT, time exercises with medication,** and use supplemental oxygen as necessary

CHRONIC RENAL FAILURE: Exercises to ↓ **CV and metabolic risks** and counteract muscle wasting

CONG. HEART FAILURE: Focus on exercises that **↑ CV function,** contractility, hypertension, and lipid profiles

CORONARY ART. DISEASE: **Combine exercise modalities** to ↑ exercise capacity and metabolic health, adjusting for heart rate responses

DEMENTIA: **Supervise exercise** in cases of moderate to severe cognitive impairments and **prevent head trauma**

DEPRESSION: **Aerobic exercise and high-intensity RT** are recommended for major depression

OSTEOPOROSIS: Incorporate **high-impact activities** if tolerable, **RT** for targeted muscle strengthening and **balance training** to prevent falls

PERIPH. VASC. DISEASE: Use systemic vascular effects and **adapt exercises** such as **upper limb ergometry**, and focus on exercise till the onset of claudication

STROKE: Start with **RT** and **balance training**, **supervise** closely if cognitive impairment is present, and **avoid Valsalva** maneuvers

TYPE 2 DIABETES: **Exercise regularly every 48 hours** to optimize glucose control, avoid impact activities if neuropathy is present, and **monitor glucose** levels

VENOUS STASIS DISEASE: Focus on **lower body training** to enhance **fluid return** via the lymphatic system and **elevate legs** when possible

Jackson Fyfe, PhD @jacksonfyfe

Source: Izquierdo M, de Souto Barreto P, Arai H, et al. Global consensus on optimal exercise recommendations for enhancing healthy longevity in older adults (ICFSR). J Nutr Health Aging. 2025;29(1):100401. doi: 10.1016/j.jnha.2024.1004

THE WESTERN
Foot and Ankle Conference

REGISTER NOW
AND SAVE THE MOST
THROUGH **APRIL 1**

Visit **TheWestern.org**

THE 2026 WESTERN

JUNE 25-28

FOOT AND ANKLE CONFERENCE

Come for the top-notch education, stay for the networking at the Happiest Place on Earth!

- **General Sessions** offering 27 CECH for DPMs – get more for your money!
- **On-Demand Fluoroscopy course** adding 4 fluoroscopy/radiology CECH included for all DPMs
  * Opportunity to earn 3 Pain Management CECH included
- **Engaging Exhibit Hall** with a variety of vendors everything you need for your practice, from billing to surgery - including hands-on training in the Innovations Hub and Mobile Labs
- **Risk Management program** for your PICA discount
- **2-Day program for Medical Assistants** covering front and back office – 1 day administrative, 1 day of clinical hands-on training!
- **New and improved meeting app** for an elevated user experience
- **Amazing discounts** on hotel reservations
- **Discounts** on theme park tickets for your family

DISNEYLAND® HOTEL & CONVENTION CENTER
ANAHEIM, CA

PICA
A ProAssurance Company

GET 10% PREMIUM CREDIT toward a maximum of 15%

Visit thewestern.org or contact PICA for details!

Visit TheWestern.org for more information and to register.