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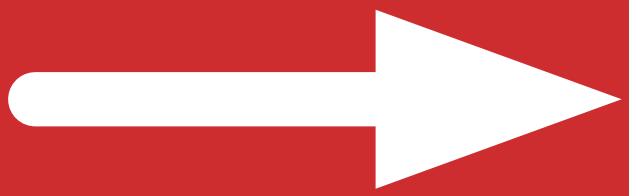

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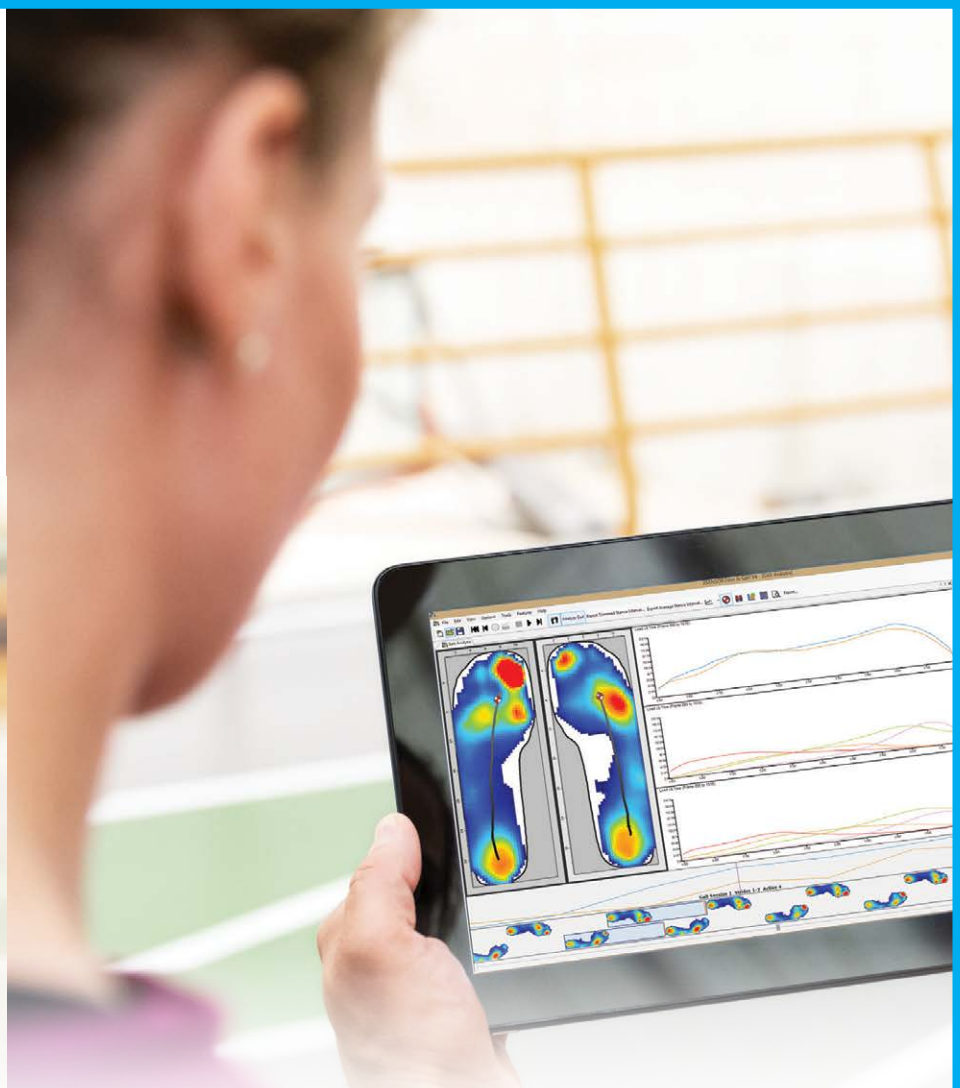
By Cassandre Voltaire, DO

The rapid pace of technological advancement is hard to track, so these authors will be providing monthly updates on the latest in computer-aided gait assessment.

By Jay Segel, DPM; Sally Crawford, MS



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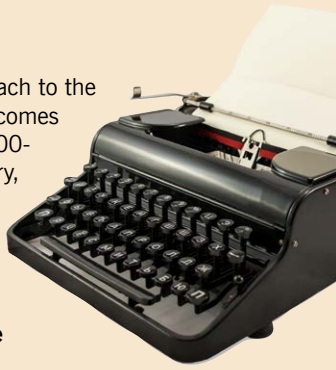

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Please attach manuscript as an MS Word file or plain text. Tables may be included in the main document, but figures should be submitted as separate jpg attachments. Send to: **janice@lermagazine.com**

Prodigy Sports Kids Need Specialized Care

By Robert Weil, DPM

Hey sports parents, coaches, and their special kids, what do I mean by the prodigy sports?

Very briefly, prodigy sports tend to be those athletic endeavors that are played mostly solo, such as tennis, ballet, figure skating, dance, or gymnastics plus soccer; some folks throw baseball pitching in there because of its unique skillset.

Age-wise, I'm talking about adolescents and youngers who are specializing in just one sport. So often, young talented athletes and their parents are faced with the question regarding their concentrating on their FAV main sport versus playing multiple sports. Today, it's not unusual to see kids under age 12, even some as young as age 6, already putting all their efforts – and their parent's money – into a single sport. The multi-sport athlete is far less common than years ago (remember those letter sweaters with letters for each sport?).

Some parents and coaches believe that youngsters will fall behind if they play different sports instead of just THE one sport; this is commonly called *early specialization*. Is early specialization good or bad? Does it achieve the outcome these parents and coaches are striving for? This is a good question with no exact answer!

ALL experts – sports medicine doctors, orthopedic surgeons, physical therapists, and athletic trainers – agree that early specialization is risky both physically and mentally!

MY bottom line has always taken into account the young athlete's passion and insistence to specialize–hearing *that kid* say "I'm not interested in other sports, period!" It is the athlete's passion I need to hear. Sports parents gotta listen!

YES, stressing and explaining to your youngster the facts and opinions of these experts about pros and cons is, of course, important, but so is listening to the child's thoughts and feelings. AND if the decision is to specialize, then let's understand that these prodigy kids require some SPECIAL attention!

Dr. Robert Weil with Olympic Gold Figure Skater Evan Lysacek.

By Special Attention I Mean…

Here are some important points:

1. Physically, with young growing bodies, playing the same sport with the same movements, same muscles used, same stresses to tissues is very challenging. Overuse and repetitive motion injuries to the upper and lower extremities are a real problem. It's an unfortunate fact that these injuries are a youth sports epidemic. What I call the "Terrible 2s" – too much, too soon, too aggressive, can happen in any new sporting endeavor, but many feel that specializing just multiplies these problems.
2. It is important to include off sport and sport-specific functional conditioning that helps to develop the overall athlete

and strengthening to prevent repetitive motion injuries. Often, this means a home program. Concentrate on what my long-time colleague and late National Fitness HOF teammate Bob Gajda, a famous sports performance specialist, called "strengthening the stabilizers and opposites." These are the muscles and tendons that stabilize, counteract, and control these repetitive motions. Athletic trainers, physical therapists, and personal trainers can help devise and supervise these programs. Proper technique is essential. This kind of functional training is also great for multi-sport athletes.

3. Make sure that strengthening feet and ankles and working balance is included, no matter what the sport, level, or age! This is vitally important!

Gymnastics, figure skating, tennis, soccer, ballet, and dance, etc., are all examples of these prodigy sports. It's common for me to see young figure skaters under the age of 10 skating and jumping 5–6 days/week. They are committed and want to go to practice. These kids are simply not interested in other sports – period! Young 10-yr-old Evan Lysacek (wearing the orthotics in his skates that I prescribed for him!) went on to be a 2010 Olympic Gold Medalist! These kids mean business!

Most sports medicine doctors, physical therapists, and athletic trainers agree that playing multiple sports is a safer route to take where injuries are concerned. They also agree that early specialization is a greater risk for overuse and repetitive motion injuries. Participating in multiple sports early with possible specialization waiting until the teens is preferred.

But that's a pretty tough sell with these prodigy kids – especially the really talented ones! Too many coaches and traveling and/or club teams really push the myth that not specializing early will cause these kids to "fall behind" in the contest to be at their best for their key sport. But there is no evidence that this is true. Indeed, based on ScholarshipStats.com, *"As far as college gymnastics is concerned, 9% of the 19,231 high school girls who try out for colleges make the team; whereas 19.1% of boys do."*[1]

There are many examples of great athletes in all sports who grew up playing many sports and only after their early teens paid total attention to their one sport. I remember the vast majority of the US Women's Gold Cup soccer players played multiple sports growing up...surprise!

Importance of R&R

One of my key points is the importance of rest and recovery. The necessity of R & R both physically and mentally can't be overstressed! Young growing bodies need to recover. Sports medicine and exercise physiology science have come a long way with new methods and tools helping with recovery, but these cannot replace smart and effective R&R.

I call it "Intelligent Rest!" Some of the most successful young athletes I've seen over the years, especially in prodigy sports, will take off 3–4 weeks a couple times a year. Take off? That means a real break from their sport – **no training or practice**. Doing other things, like just being a kid! Physical activities like gym, bike, or swim, just no sport-specific stuff. Sports parents must insist on these breaks – because often, the coach or youngster won't.

Burnout Knows No Age Limit

Another pitfall is what I call on my radio show "the mental game" and the real concern of burnout. Sports parents need to be aware that when these kids don't get these R&R breaks or don't still have non-sport *fun*, they can really turn off. The late sports psychologist Jim Vicory, who shared some of my radio show in the early '90s paid special attention to this. He would stress that these kids, no matter how talented or serious in their sports, needed to have fun. They were not small adults but young developing children who need to learn through experience and not be robots constantly drilled. The pressures, some from parents, coaches, and the kids themselves, are very real and can be relentless – the competition alone can be very challenging in itself. Adding the mental pressures of having to try to play through soreness or injury just adds to these problems – and I won't even get into the whole other hassle with over-the-counter pain meds being greatly overused!

Youth sports and drugs is a big problem – the pressures, schedules, and physical demands on these kids are extreme. I'll repeat my "The Sports Doctor" radio message for parents and coaches: IF your kid needs pain medicine to participate, play, or practice, you are over the line…it's time to back off!

Lastly, much of the push to specialize is driven by money. Youth sports is a $20 million yearly business. Club and travel sports teams are often year round at expensive facilities and camps. The priority for many of these facilities is staying open, not necessarily your athlete's future. Sadly, sports parents too often have stars in their eyes thinking of scholarships…or even the pros – what are those odds (Table, page 12)? Well, for football, the chances of going pro are slim. According to TeamSnap, it's something only 1% of the top 1% can achieve.[2]

Given those odds, one has to ask: Whose goal or dream is this really? If it's the young athlete's, then taking care to avoid overuse, paying attention to functional conditioning as well as feet and balance, and enforcing good old-fashioned play every now and then can go a long way to making dreams come true.

The challenges of youth sports continue...as clinicians, we need to PAY ATTENTION.

Continued on page 12

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TABLE. PROBABILITY OF COMPETING BEYOND HIGH SCHOOL

	NCAA Participants	Approximate # Draft Eligible	# Draft Picks	# NCAA Drafted	% NCAA to Major Pro	% NCAA to Total Pro
Baseball	38,849	8,633	614	444	**5.1%**	--
M Basketball	19,213	4,270	58	46	**1.1%**	20.6%
W Basketball	16,668	3,704	36	33	**0.9%**	8.9%
Football	77,204	17,156	259	259	**1.5%**	--
M Ice Hockey	4,388	975	224	69	**7.1%**	--
W Soccer	29,959	6,658	48	47	**0.7%**	--
Softball	21,646	4,810	24	24	**0.5%**	--

Source: NCAA Research. Estimated probability of competing in professional athletics. Published April 2024. Available at https://www.ncaa.org/sports/2015/3/6/estimated-probability-of-competing-in-professional-athletics.aspx. Accessed Feb. 11, 2025.

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1. Gymnastics: 87 US colleges sponsor varsity gymnastics teams. Available at https://scholarshipstats.com/gymnastics. Accessed Feb. 11, 2025.
2. Alexander Hawke. What Are My Chances of Going Pro? TeamSnap.com. Available at https://www.teamsnap.com/blog/general-sports/chances-of-going-pro. Accessed Feb. 11, 2025.

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.*

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CHRONIC ANKLE INSTABILITY: THERAPEUTIC EXERCISE AND DATA ANALYSIS

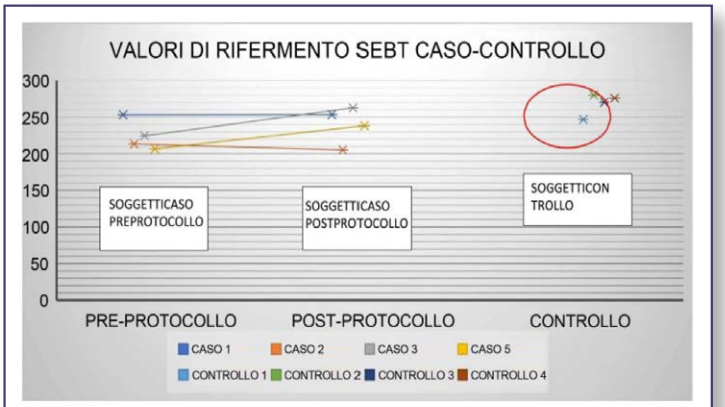


Figure 11. Comparison of SEBT reference values in case-control subjects.

A new study from Italy examines individuals with a previous history of acute inversion ankle sprain who have subsequently developed chronic ankle instability (CAI) by using 4 validated field tests: Star Excursion Balance Test (SEBT); Balance Error Scoring System (BESS); Time in Balance Test (TIBT); and Side Hop Test (SHT).

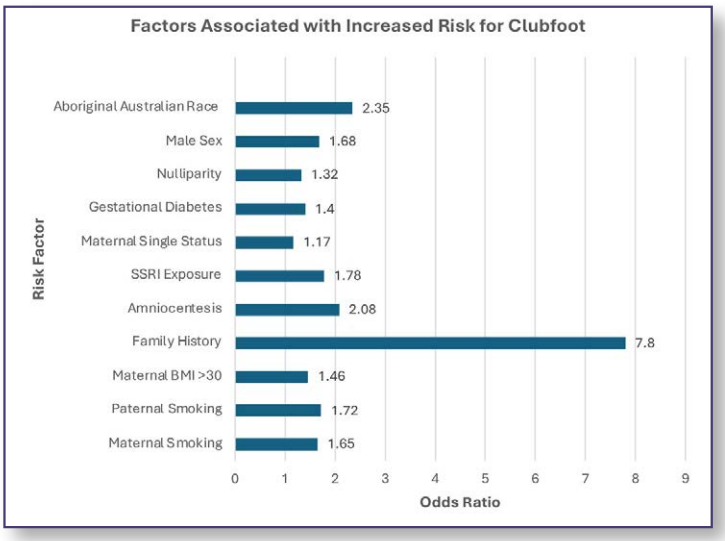
The participants were divided into 2 categories: those with CAI > 1 year and those with CAI ≤1 year and participated in a 6-week protocol focused on improving balance in single stance, improving static and dynamic stability, strengthening the gluteus medius and maximus (pelvis stabilizers) and strengthening of the foot's intrinsic muscles. At the end of the protocol, participants were re-evaluated with the same field tests. used previously and the data obtained were compared both

Post-protocol results are extremely positive in participants with CAI ≤ 1 year; results for participants with CAI >1 year were null or even worse in the dynamic stability test (SEBT), except for static stability tests.

The authors concluded that those with CAI > 1 year need work protocols that are significantly longer than 6 weeks and focus on improving static stability and trying to reduce any muscular imbalances present in the upper structures, particularly the pelvis. For participants with CAI ≤ 1 year, the authors advise starting functional re-education as soon as stabilization is achieved to allow any relapses to be reduced to a minimum and, in particular, to avoid the onset of chronic ankle instability.

Source: *Bellomo RG, Barletta G, Brunetti M, Barbato C. (2024) Chronic Ankle Instability: therapeutic exercise and data analysis. Open Journal of Orthopedics. 2024;14: 201-217. https://doi.org/10.4236/ojo.2024.145019. Use is per the International Creative Commons License CC BY 4.0.*

CLUBFOOT ETIOLOGY



BMI, body mass index; SSRI, selective serotonin reuptake inhibitor.

Data is derived from a meta-analysis and systematic review of the literature that looked at 42 studies including 28 case-control, 10 cohort, and 4 randomized trials, comprising 31,844 clubfoot cases and 6,604,013 controls. The authors concluded that recognition of modifiable risk factors may help in counseling patients and minimizing clubfoot incidence.

Source: *Chen C, Kaushal N, Scher DM, et al. Clubfoot Etiology: A Meta-Analysis and Systematic Review of Observational and Randomized Trials. J Ped Ortho. 2018;38(8):p e462-e469. DOI: 10.1097/BPO.0000000000001191.*

AC E-STIM UNIT SHOWS IMPROVEMENT IN DPN

Diabetic peripheral neuropathy (DPN) is a common complication in both Type 1 and 2 diabetes, affecting both large and small nerve fibers, most commonly in the feet and hands. While drug therapies and their multiple side effects have been the traditional response, electrical stimulation (e-stim) has been showing promise and is frequently advertised on the Internet. It is a noninvasive therapeutic modality that has few side effects and contraindications and no known drug interactions.

A limited number of clinical studies have investigated the use of e-stim for DPN symptoms. Many have used transcutaneous electrical stimulation (TENS), which employs lower frequencies and alternating currents (ACs), and have seen some effectiveness for pain associated with neuropathy but have limited impact on other symptoms. In contrast, clinical studies have found that direct current (DC) neuromuscular e-stim

at higher frequencies is significantly more effective than TENS at ameliorating symptoms like motor function and numbness. In addition, the process of activating denervated muscles necessitates a longer duration of electrical pulses, which can be achieved using DC but not AC.

Historically, DC has been less useful in the clinical setting, as the continuous unidirectional flow of ions leads to a buildup of charge that can cause skin irritation and burns. Recent advances in DC technology have addressed this issue, allowing for the safe use of DC in clinical applications. One such device is the Neubie [Neurological Fitness Equipment and Education LLC [NeuFit]). Most commercially available DC devices address charge buildup by using very short pulse widths (5–200 ms) at high voltage. However, a longer pulse width has been found to be more effective for clinical application. To this point, the Neubie counters and eliminates the issue of irritation and pulse width with an additional carrier waveform that dissipates charge buildup, allowing for the safe use of a longer pulse width (460 ms).

This randomized controlled trial sought to evaluate and compare the effectiveness of treatments with two different electrical stimulation (e-stim) devices—pulsed direct current (DC) (Neubie) and alternating current (AC) (transcutaneous electrical stimulation [TENS])—in the treatment of symptoms for patients with diabetic peripheral neuropathy (DPN).

One hundred fifty participants were recruited from 13 Hands-On Diagnostics–affiliated sites across several US locations. Participants were randomly divided into 2 groups for comparison—Neubie and TENS. Participants received a 30-min foot stimulation protocol with either TENS unit electrodes or Neubie electrodes. Outcome measures included the Toronto Clinical Neuropathy Score (TCNS), 2-point discrimination, visual analogue scale (VAS), vibration sense (VBS), nerve conduction velocity (NCV), and nerve amplitude. The effect of the 2 variables on all outcome measures was determined using an analysis of covariance (ANCOVA).

The Neubie group demonstrated statistically significant improvements in TCNS for both right and left sides ($P < 0.001$), 2-point discrimination of the dominant foot ($P = 0.001$), VBS ($P = 0.022$) and VAS scores ($P = 0.009$), and some but not all nerves tested by NCV ($P < 0.05$).

Overall, DPN treatment with the Neubie resulted in significant improvements in several major outcome measures, whereas TENS showed no significant difference in any outcome measure. These findings support the use of DC devices as a potentially superior therapeutic treatment for neuropathy over AC devices like the TENS unit. ler

Source: *Kostopoulos D, Rizopoulos K, McGilvrey J, et al. An open-label comparative study of the impact of two types of electrical stimulation (Direct Current Neuromuscular Electrical Stimulation and Transcutaneous Electrical Stimulation) on physical therapy treatment of diabetic peripheral neuropathy. J Diabetes Res. 2025;2025:9970124. doi: 10.1155/jdr/9970124. Use is per the International Creative Commons License CC BY 4.0.*

WEIGHT MAINTENANCE POSSIBLE WITHOUT CONTINUED GLP-1 RA THERAPY

TABLE 4 Weight loss maintenance outcomes of successful medical weight loss bundle patients (defined as BMI <30 kg/m^2 at 12 mo)

	Initial visit	6 mo ± 45 d	12 mo* ± 45 d	18 mo** ± 45 d	24 mo** ± 45 d	576 d** ± 20.2 d (most recent encounter in health record)
Weight (lb)	221.4 ± 4.6	188.8 ± 3.9	169.58 ± 3.9	172.9 ± 4.6	187.9 ± 4.9	168 ± 4.5
BMI (kg/m^2)	36.4 ± 0.5	30.43 ± 0.9	27.6 ± 0.8	29.0 ± 0.8	34.2 ± 1.1	27.7 ± 0.6
Weight loss (%) from initial obesity encounter	0	−14.8 ± 1.5	−22.2 ± 3.3	−22.8 ± 1.6	−16.1 ± 1.6	−25.2 ± 2.2
N	105	93	85	27	5	77
Body fat (%), $p < 0.05$	45.9 ± 0.9		35.8 ± 1.6			

Note: Data at 6, 12, 18, and 24 mo derived from medical weight management encounters; data at 576 d derived from most recent encounter note either with specialist or primary care. Patients were transitioned off glucagon-like peptide-1 receptor agonist class of agents at 12 mo and transitioned to oral generics (metformin, topiramate, bupropion, naltrexone monotherapy, or combination; phentermine was avoided in most cases due to its controlled substance designation upon transition to primary care). Data are mean ‡ 95% CI unless otherwise indicated.

*$p < 0.05$, 6 mo vs. 12 mo.

**$p > 0.05$, 12 mo vs. 18 mo, 576 d, 24 mo; 18 mo vs. 24 mo.

Objective: The high cost of novel glucagon-like peptide-1 receptor agonist (GLP-1 RA) class agents often limits access and creates barriers to care. This real-world study evaluated the efficacy of older-generation generic antiobesity medications (AOMs) for weight maintenance after 1 year of GLP-1 RA therapy in patients who had achieved successful weight loss.

Researchers from Vanderbilt University in Nashville, Tennessee, prospectively followed patients (N = 105) who had completed 12 months of therapy and were part of a "medical weight loss bundle," which included 12 months of GLP-1 RA therapy followed by 6 months of transition care. The baseline mean BMI was 36.4 kg/m2. Body weight outcomes were measured at 6, 12, 18, and 24 months.

After the medical weight loss bundle, 40 patients transitioned to generic AOMs. At 12 months, this cohort lost an average of 18.3%, 95% CI [13.0%, 23.6%] body weight from baseline, with a mean BMI of 27.9 kg/m2. At 18 months, they maintained the weight loss, with a mean BMI of 27.9 kg/m2. Subsequent follow-up visits (average 1.5 months later) without GLP-1 RAs showed further reduction, resulting in a total average weight loss of 25.5%, 95% CI [23.1%, 27.9%] compared to the initial visit.

The authors concluded that patients who are successfully treated with GLP-1 RAs can maintain their weight loss using generic older-generation AOMs, suggesting potential cost savings for insurers and implications for policy regarding AOM coverage. ler

Source: *Paddu NU, Lawrence B, Wong S, Poon SJ, Srivastava G. Weight maintenance on cost-effective antiobesity medications after 1 year of GLP-1 receptor agonist therapy: a real-world study. Obesity (Silver Spring). 2024 Dec;32(12):2255-2263. doi: 10.1002/oby.24177. Use is per the Creative Commons License.*

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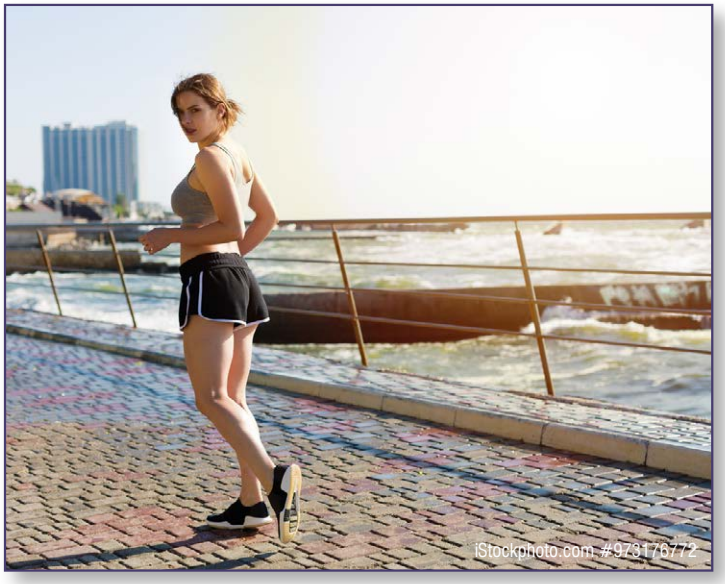
LINKEDIN POST OF THE MONTH

BACKWARD WALKING AS THERAPY FOR FORWARD HEAD POSTURE

The presence of spinal arches is crucial for maintaining good body posture, reducing pressure on joints, and preventing deformities caused by misalignment. Engaging in exercises that focus on correcting body alignment, such as walking backward, can enhance posture and various related factors.

Researchers from across Iran selected a group of 46 female students suffering from forward head posture (age: 22.89 ± 2.31 years, height: 1.63 ± 0.05 m, weight: 60.01 ± 5.41 kg, body mass index: 22.38 ± 1.28 kg/m2) and randomly divided into 2 groups. The intervention group participated in 3 exercise sessions per week for 4 weeks, while the control



group did not receive any intervention during the study. Changes in the craniovertebral angle, proprioception, resistance, and foot pressure were measured using photogrammetry, head-neck angle examination with a laser pointer, a balance measuring device, and a foot scanner.

The results of this study showed that the training program had a significant effect on the craniovertebral angle ($P = 0.001$), neck proprioception ($P = 0.001$), balance ($P = 0.001$), and sole pressure ($P = 0.001$). Likewise, the results of the group comparison revealed significant differences in various variables, such as the craniovertebral angle ($P = 0.001$), neck proprioception ($P = 0.001$), balance ($P = 0.001$), and plantar pressure ($P \geq 0.05$).

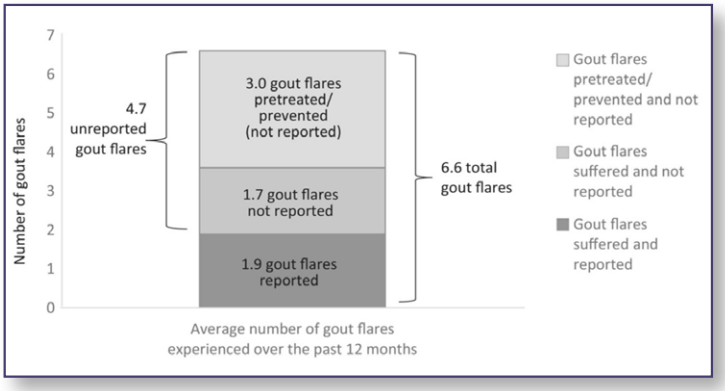
This study demonstrated that walking backward enhanced the craniovertebral angle, proprioception, balance, and alterations in the plantar center of pressure. Therefore, this exercise is recommended as a complementary therapeutic approach for individuals with forward head posture. ler

Source: *Mahmoudi M, Hovanloo F, Shahpar FM, Barati A. A period of backwards walking affects the craniovertebral angle, proprioception, balance, and foot pressure on forward head posture of female students. J Bodyw Mov Ther. 2024;40:1844-1851. doi: 10.1016/j.jbmt.2024.10.040.*

GOUT FLARE BURDEN IN THE UNITED STATES

Researchers from University of Houston in Texas used an online survey to assess the burden of gout flares in a sample of US adults >18 years.

Nearly 1,000 participants met the study criteria for having gout. Those with gout tended to be older (58.3 [SD 13.3] years vs 45.4 [SD 16.1] years; $P < 0.001$), male (76.3% vs 46.9%; $P < 0.001$), White (80.5% vs 76.8%; $P = 0.01$), and married or living with their partner (58.9% vs 52.8%; $P < 0.001$) compared with those without gout (n =



30,146). The **total gout flare burden for those with gout was 6.6 gout flares per year**. Nearly 72% of gout flares were either not reported to physicians or pretreated or prevented. Characteristics of those who were less likely to report gout flares included being younger, being less educated, having a lower Charlson Comorbidity Index score, not being diagnosed with gout by their doctor, and not taking a urate-lowering therapy.

Source: *Singh JA, Morlock A, Morlock R. Gout flare burden in the United States: a multiyear cross-sectional survey study. ACR Open Rheumatol. 2025;7(1):e11759. doi: 10.1002/acr2.11759.*

MOTOR NEURONS POSITIVELY STIMULATED BY LIFE-LONG EXERCISE

Exercise preserves neuromuscular function in aging through unknown mechanisms. Skeletal muscle fibroblasts (FIB) and stem cells (MuSC) are abundant in skeletal muscle and reside close to neuromuscular junctions, but their relative roles in motor neuron maintenance remain undescribed. Using direct cocultures of embryonic rat motor neurons with either human MuSC or FIB, RNA sequencing revealed profound differential regulation of the motor neuron transcriptome, with FIB generally favoring neuron growth and cell migration and MuSC favoring production of ribosomes and translational machinery. Conditioned medium from FIB was superior to MuSC in preserving motor neurons and increasing their maturity. Lastly, these authors established the importance of donor age and exercise status and found an age-related distortion of motor neuron and muscle cell interaction that was fully mitigated by lifelong physical activity.

In conclusion, the research team show that human muscle FIB and MuSC synergistically stimulate the growth and viability of motor neurons, which is further amplified by regular exercise.

Source: *Soendenbroe C, Schjerling P, Bechshøft CJL, et al. Muscle fibroblasts and stem cells stimulate motor neurons in an age and exercise-dependent manner. Aging Cell. 2024;18:e14413. doi: 10.1111/acel.14413. Use is per the CC BY International license.*

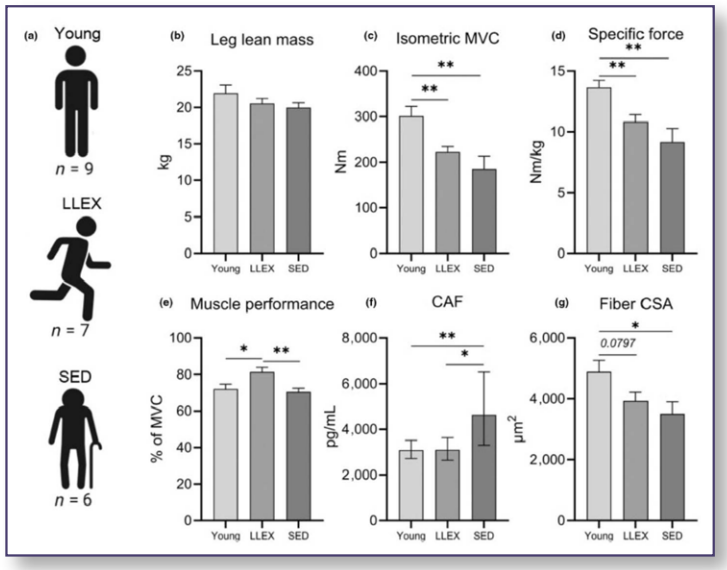


Figure. Sedentary aging is associated with reduced muscle performance and neuromuscular disturbance in vivo. (a) In vivo characterization of male participants. (b) Leg lean mass, measured by DEXA. (c) Isometric unilateral knee extension MVC, measured in a dynamometer. (d) Specific force, calculated as MVC per leg lean mass. (e) Muscle performance, measured as force exerted during repeated maximal knee extension concentric contractions, expressed relative to MVC. (f) CAF, measured in plasma by ELISA. Statistical analysis was conducted on log transformed values. (g) Muscle fiber cross sectional area measured using immunohistochemical analyses of muscle biopsy cross-sections. All data are means ± SEM except CAF which is shown as geometric means with 95% CI. N: LLEX: 7, SED: 6, Young: 9. Statistics: Data were analyzed by unpaired two-tailed t-tests, with significance indicated by $*P < 0.05$, $** P < 0.01$, $*** P < 0.001$. CAF, C-terminal Agrin Fragment; DEXA, dual-energy X-ray absorptiometry; LLEX, life-long exercisers; MVC, maximal voluntary contraction; SED, old sedentary.

D-MANNOSE PROMOTES DIABETIC WOUND HEALING IN RATS

Diabetic chronic foot ulcers pose a significant therapeutic challenge around the world, resulting in adverse effects and complications in patients. D-mannose is enriched in citrus peel and exerts beneficial effects among various diseases, especially against inflammation-related disorders.

These authors examined the potential effect of D-mannose during the wound healing process in streptozotocin (STZ)-induced diabetic mice in vivo and by culturing keratinocytes under high glucose condition in vitro. The skin lesion healing was recorded in photos and evaluated by histochemical staining. What's more, the advanced glycation end products (AGEs) concentration in blood and mice skin was quantified. Apoptotic cells were assessed by flow cytometry and Western blotting. Inflammatory cytokines and cellular differential gene expression levels were measured by real-time PCR. The expression of the AMPK/Nrf2/HO-1 signaling-related molecules was determined by Western blotting.

Their results found that topical supplementation of D-mannose

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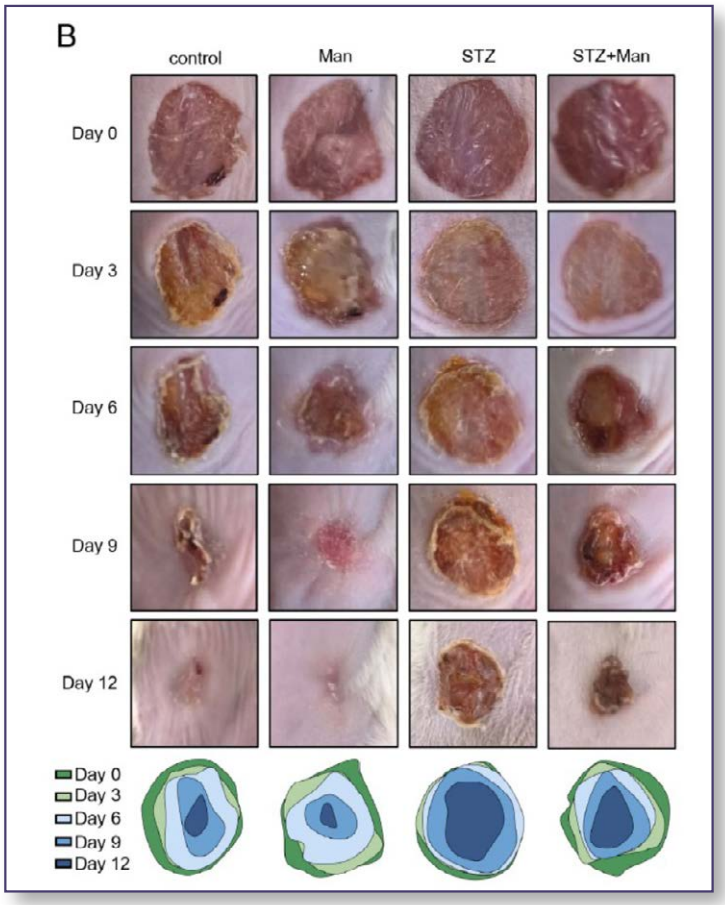

Figure. D-mannose promoted diabetic wound healing in STZ-induced mice. Balb/c mice (n=5) received STZ injection and wound punch onto dorsal skin to establish diabetic wound healing, along with or without D-mannose topical application. **(B)** Representative photomicrographs of wounds on mice skin and traces of wound closure.

remarkably improved skin wound healing in diabetic mice. Furthermore, both in vivo and in vitro experiments demonstrated that D-mannose reduced the AGEs generation. Mechanistically, D-mannose inhibited AGEs, then upregulated AMPK/Nrf2/HO-1 signaling in the context of high glucose to maintain keratinocyte normal functions, which positively influenced macrophage and fibroblast to accelerate diabetic wound healing. Noteworthily, these protective effects of D-mannose were abolished by the pretreatment with inhibitors of AGEs or AMPK.

The authors note that this is the first study exploring the protective role of D-mannose on diabetic wound healing via topical supplementation. Their findings show that D-mannose protects keratinocytes from high glucose stimulation via inhibition of AGEs formation as well as orchestrates inflammatory microenvironment in diabetic wounded skin, suggesting its supplementation as a potential therapy to promote refractory wound healing in diabetic patients.

Source: *Luo J, Wu T, Zhang J, et al. D-mannose promotes diabetic wound healing through inhibiting advanced glycation end products formation in keratinocytes. Mol Med. 2025;31(1):15. doi: 10.1186/s10020-025-01070-3. Use is per the CC BY International License.*

SOCIOECONOMIC STATUS AFFECTS VLU OUTCOMES

A recent study in the *Journal of Wound Care* reported on the impact of dual-enrolee (Medicare/Medicaid) status on venous leg ulcer (VLU) outcomes in more than 555,000 Medicare beneficiaries. The study found that patients with dual-enrollee status have incomes ranging from slightly above, at, or below the poverty level; greater numbers of comorbidities; and are more than twice as likely to be from an ethnic minority group compared with Medicare-only enrollees. Their socioeconomic status is associated with VLU treatments that take longer to close, develop higher numbers of complications, and use significantly more hospital resources, resulting in greater expense. Many Social Determinants Of Health (SDOH) impact the outcomes for these patients and are differentiated from patients covered only by Medicare. Outcomes improved when dual-enrollees were treated with a cellular, acellular, and matrix-like product (CAMP), such as dehydrated human amnion chorion membrane (DHACM), while following parameters for use (FPFU). Socioeconomic variables are associated with poor outcomes for patients with VLUs and should be tracked to find opportunities, such as DHACM treatments FPFU, to improve health outcomes and quality of life. SDOH deserves increased attention to improve patient outcomes. *This study was supported by MiMedX.*

Source: *Wahab N, Tettelbach WH, Driver V, et al. The impact of dual-enrolee (Medicare/Medicaid) status on venous leg ulcer outcomes: a retrospective study. J Wound Care. 2024;33(12):886-892. doi: 10.12968/jowc.2024.0174.*

FLIP-FLOPS WITH CUSTOM INSOLES DO NOT RELIEVE PAIN

A recent study from Brazil evaluated the use of custom-made insoles adapted to flip-flops on pain intensity, foot function, and functional walking ability in individuals with persistent plantar heel pain. This

randomized controlled trial assessed 80 participants at baseline, 6 and 12 weeks, and then 4 weeks post-intervention. At all 3 check points, no between group difference was observed in the intensity of morning pain or pain with walking. What differences were found were smaller than the minimum clinically important difference for pain (2 points). The authors concluded that custom-made insoles fitted to flip-flops did not differ from flip-flops with sham insoles in improving pain intensity, foot function, and functional walking ability in people with persistent heel pain. ler

Source: *Fagundes MG, Mendes AAMT, Bezerra VF, et al. Effects of insoles adapted in flip-flop sandals in patients with persistent plantar heel pain: A sham-controlled randomised trial. Clin Rehabil. 2024;38(11):1466-1480. doi: 10.1177/02692155241267991.*

TALAR NECK NON-UNIONS: CLINICAL AND RADIOLOGICAL OUTCOMES OF 8 CASES

Significant hindfoot deformity and morbidity can result from talar neck non-unions but are not often reported in the literature. Surgical management is evolving, with recent publications on the results of open reduction and internal fixation (ORIF) with bone grafting (BG), ankle fusion and modified Blair fusion. These authors report the clinical and radiological outcomes of a cohort of talar neck non-unions managed by ankle joint preserving reconstruction.

Eight patients (7 male and 1 female; mean age, 32.3 ± 13.1 years) with talar neck non-unions underwent ORIF+BG through dual approaches. Additional medial malleolar osteotomy was done in 2 cases, and calcaneofibular split approach to the subtalar joint in 3. Adjunct subtalar fusion was done in 5 cases. Clinical and radiological evaluation was performed pre- and post-operatively. Functional outcomes were assessed by the Manchester Oxford Foot Questionnaire (MOxFQ).

The mean surgical delay was 4.1 ± 1.7 months. As per Zwipp and Rammelt classification of post-traumatic talar deformities, 5 cases were classified as Type 3, 2 were Type 4, and 1 was Type 1. Union was achieved in 7 cases at a mean of 3.4 ± 1.3 months. One case had progressive collapse, which was managed by pantalar arthrodesis. All 3 cases where subtalar fusion was not performed primarily demonstrated subtalar arthrosis, but none required a secondary subtalar fusion. The MOxFQ score from 61.1 ± 10.1 to 41 ± 14.1 postoperatively (P = 0.005). The mean follow-up was 14.6 ± 6.8 months.

The authors concluded that ORIF+BG of the talar neck, with or without subtalar fusion has the potential to achieve solid union, correct the hindfoot deformity and improve functional outcomes. However, the long-term efficacy of this procedure is still unknown. ler

Source: *Dhillon MS, Patel S, Sharma S. Clinical and radiological outcomes of ankle joint preserving surgical reconstruction for talar neck non-unions-A series of 8 cases. Injury. 2024;55 Suppl 2:111409. doi: 10.1016/j.injury.2024.111409.*

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Surgical Considerations for Flexible Adult Stage 2 Flatfoot

A SUMMARIZED TALK BY JOSEPH PARK, DPM, FACFAS

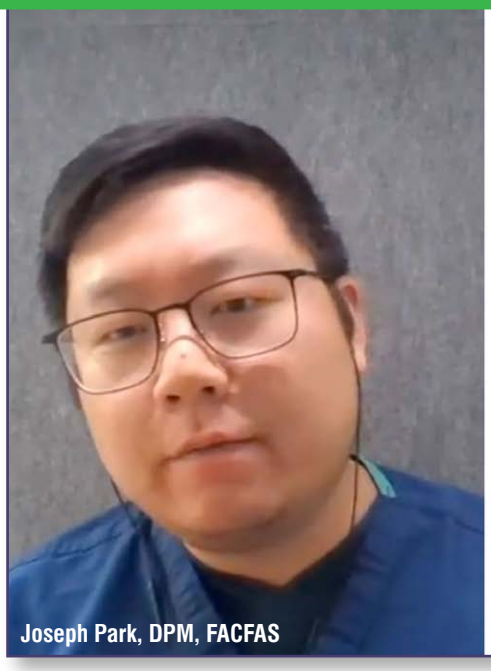
Flatfoot, particularly flexible adult Stage 2 flatfoot, presents a complex challenge. This summary reviews proper patient evaluation for the condition and discusses the critical non-surgical and surgical considerations for managing stage 2 flatfoot, offering a deep dive into both soft tissue and osseous procedural options. By understanding the pathology's nature, evaluating the demographic factors, and considering various surgical options, healthcare providers can tailor treatments that effectively address the specific needs of each patient.

Flexible adult stage 2 flatfoot, characterized by a deformity that remains correctable, highlights a progression from Stage 1 where no deformity exists, just isolated posterior tibial tendon issues. In stage 2 flatfoot, the deformity is evident but still flexible, allowing some alignment upon manipulation. This stage is crucial for intervention as the condition has not yet led to the rigid deformities found in later stages.

Following the Johnson and Strom system, stage 2A involves a visible but correctable deformity without significant abduction or additional plane deformities. Transitioning to stage 2B introduces a complexity where the deformity includes abduction, evident in the transverse plane component. These stages necessitate a tailored approach, focusing on preserving flexibility while addressing the deformity structurally and symptomatically.

Key Patient Considerations

Age: Age significantly impacts the approach to treating stage 2 flatfoot. Younger adults may have inherent flexibility aiding recovery, potentially requiring less invasive procedures.


Joseph Park, DPM, FACFAS


LER Publisher & CEO Rich Dubin

Conversely, older adults often present with additional complications such as diminished healing capacity and increased rigidity, leaning toward more aggressive interventions to ensure functionality and reduce discomfort.

Impact of BMI: The body mass index (BMI) of a patient plays a critical role in determining surgical options for stage 2 flatfoot. Higher BMI can increase the stress on the foot structure, often necessitating more robust surgical procedures to ensure adequate correction and reduce the risk of recurrence. This consideration impacts the choice of techniques, potentially leaning toward procedures that provide greater structural support to accommodate increased body weight.

Comprehensive Preoperative Evaluation

History Review: Before proceeding with surgical intervention for a flexible adult stage 2 flatfoot, it's crucial to review the patient's medical and social history thoroughly. This includes assessing the patient's age, BMI, and underlying medical conditions such as diabetes or rheumatological diseases. Smoking status and previous foot conditions must also be evaluated since they can affect surgical outcomes and recovery. Understanding the patient's level of physical activity and their social factors, such as the ability to take time off work (typically 4-6 months) for recovery, is essential. These factors help in planning the surgical approach and setting realistic postoperative expectations.

Physical Examination: The physical examination should include both non-weight bearing and weight-bearing assessments. Checking the ankle range of motion, subtalar joint motion, and the alignment of the foot are crucial. The physical examination should focus on identifying any pain during motion, the stability of the medial column, and palpation of the posterior tibial tendon to assess for tenderness or thickening. Evaluating the heel position, medial lon-

This article is a summary of Dr. Park's presentation from the 2024 No-Nonsense Seminar, March 8, 2024, moderated by LER Publisher & CEO Rich Dubin. To view this lerEXPO event, visit https://nononsense2025.lerexpo.com. Continuing education credits are available for many of our programs.

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gitudinal arch height, and forefoot positioning during single and double heel raises provides additional information on the functionality of the foot and the extent of the deformity.

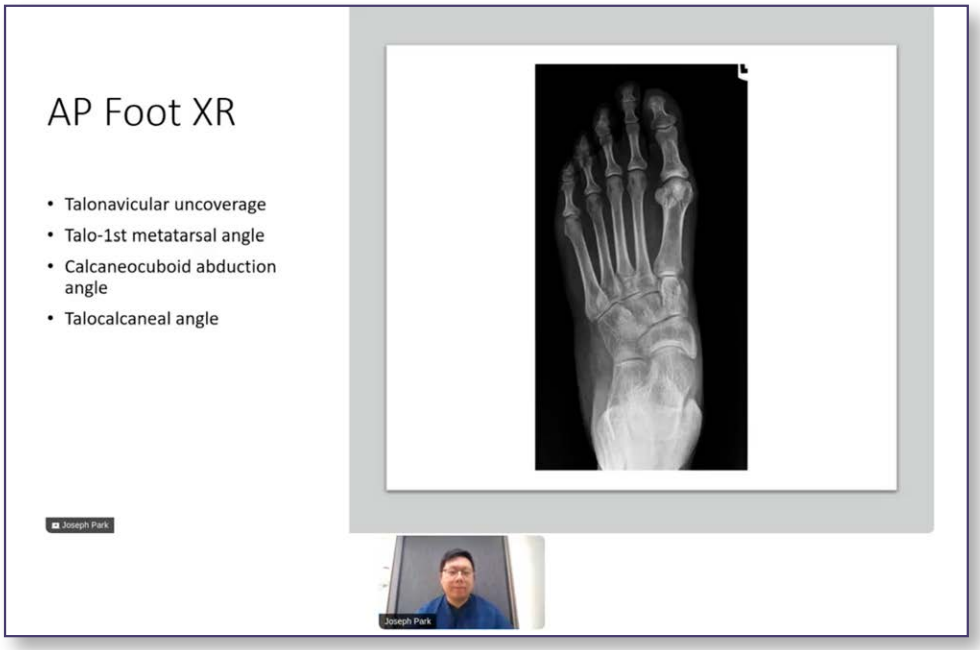
Radiographic and Diagnostic Assessment

Radiographic evaluation is key in planning the surgical correction of stage 2 flatfoot. Weight-bearing radiographs of the foot and ankle, including anteroposterior (AP), lateral, and oblique views, are standard. These images allow the surgeon to assess the alignment and structural changes in the foot. In some cases, advanced imaging techniques such as weight-bearing computed tomography (CT) scans may be useful. These scans provide a more detailed view of joint alignment, particularly in complex cases, and help in identifying conditions like sinus tarsi impingement or subtalar joint subluxation, which are harder to detect with traditional radiographs.

Analyzing radiographic indices such as the talonavicular coverage angle, calcaneocuboid abduction angle, and the talo-first metatarsal angle on AP and lateral foot views is crucial. These indices help determine the severity of the deformity and guide the surgical planning. For instance, a talonavicular coverage angle greater than 40% typically indicates pathology. The calcaneal inclination angle and talocalcaneal angle are also evaluated to assess the heel alignment and the flatfoot severity. Accurately interpreting these indices ensures appropriate surgical intervention, maximizing the chances of restoring normal foot function and reducing postoperative complications.

Decision Making: Non-Operative vs. Operative Treatment

Non-surgical management of flexible adult stage 2 flatfoot, such as orthosis use and physical therapy, has shown mixed outcomes in the long term. Studies suggest that while non-operative measures can be effective for some, a significant percentage of patients eventually require surgical intervention. O'Connor et al[1] found



that despite conservative treatment measures, roughly 24.6% of patients progressed to surgery within 5 years. Lin et al[2] reported that 70% of the patients were brace-free at follow-up, highlighting successful non-surgical management. However, 30% did not fully succeed with non-operative treatments, demonstrating need for a more definitive solution like surgery.

Surgical intervention is considered when non-operative treatments fail or when the patient's activity level and quality of life are significantly impacted. Research by Coster et al[3] showed substantial benefits, including pain reduction and functional improvements post-surgery for adult stage 2 flatfoot. Surgical treatments focus on realigning the foot structure, reducing pain, and restoring function, aiming for long-term patient satisfaction and mobility. Surgeons decisions weigh factors like patient age, activity desires, and the severity of the foot deformity.

Surgical Treatment Options for Stage 2 Flatfoot

Soft Tissue Procedures: Soft tissue procedures in the surgical treatment of stage 2 flatfoot often

include gastrocnemius recession or tendon transfers to correct muscular imbalances and improve foot alignment. These surgeries aid in reducing the stress on tendons and correcting minor deformities without the need for bone alteration. Techniques such as a posterior lengthening, are recommended only when the patient's activity levels are considered, as they might affect muscle functionality. Ligament reconstructions, including spring ligament and deltoid ligament repairs, may also be pursued to restore stability and prevent further deformation.

Osseous Procedures: Osseous procedures involve modifications to the bone structure to correct the foot alignment more definitively. Medial displacement calcaneal osteotomy (MDCO) is a popular method used to shift the heel bone inward and restore the foot's arch. This procedure often is complemented with lateral column lengthening when there is significant forefoot abduction, which helps in realigning the foot more comprehensively. These procedures are crucial for achieving a stable, functional foot that can support the patient's weight and activity without pain. Additional procedures like arthrodesis (joint fusion) may be considered in more severe or rigid cases, providing a permanent correction by fusing the affected joints into the correct position.

Postoperative Care and Rehabilitation

Immediate: Postoperative care following stage 2 flatfoot surgery is crucial for ensuring a successful recovery. Initially, this involves managing post-surgical pain, reducing swelling, and preventing infection. Patients are typically advised to avoid weight-bearing activities, and the use of crutches or a walker may be necessary. It is important to keep the surgical site clean and dry, and dressing changes should be performed as directed by the surgeon to avoid complications.

Long-term & Follow-up: Long-term management of stage 2 flatfoot surgery includes physical therapy focused on restoring strength and mobility. Follow-up appointments are essential for monitoring the healing process and for making necessary adjustments in the treatment plan. Patients may undergo periodic X-rays to ensure proper alignment and healing of bones. Rehabilitation exercises gradually increase in intensity based on individual recovery progress. Additionally, patients might need orthotic devices to support proper foot alignment and distribution of pressure during activities. Regular consultations help to address any ongoing issues or concerns, ensuring the best possible outcome.

Conclusion

In summary, addressing flexible adult stage 2 flatfoot surgically requires a comprehensive understandig of the patient's unique foot anatomy, lifestyle, and expectations. The decision to pursue surgery must balance the risks and benefits while considering non-operative alternatives that might be effective. When surgery is indicated, it's essential to choose the appropriate procedures aimed at correcting the specific deformity and restoring function, considering both osseous and soft tissue interventions.

The ultimate goal of surgical intervention is to reduce pain, improve foot alignment, and enhance the patient's quality of life. With careful surgical planning and execution, combined with appropriate post-operative care, patients can achieve significant improvements in foot function and overall satisfaction with their surgical outcomes. As research evolves, so do the techniques and recommendations for treating stage 2 flatfoot, affording patients better and more tailored treatment options.

Joseph Park, DPM, FACFAS, is Assistant Professor at the Western University College of Podiatric Medicine and Attending Physician at Riverside University Health System, both in Southern California.

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Cat-Related Falls and Hits Affecting the Lower Extremity Treated at United States Hospital Emergency Departments

By Mathias B. Forrester, BS

Background: An estimated 46.5 million United States (US) households owned a cat in 2023-2024. Interactions with cats may result in injury. The objective of this study is to describe cat-related falls and hits affecting the lower extremity.

Methods: Cat-related falls (falls, trips, slips, jumped down) and hits (hit or other contact with an object) affecting the lower extremity during 2000-2023 were identified using the National Electronic Injury Surveillance System (NEISS), a database of consumer product- and activity-related injuries treated at a representative sample of US hospital emergency departments (EDs). Cases reported to the NEISS can be used to calculate national injury estimates. The distribution of cat-related falls and hits affecting the lower extremity was determined for patient demographics, injury circumstances, and management.

Results: There were an estimated 45,220 cat-related falls affecting the lower extremity, representing 19.3% of the cat-related falls affecting all body parts. There were an estimated 11,909 cat-related hits affecting the lower extremity, representing 31.9% of the cat-related hits affecting all body parts. The most affected body parts for falls were the ankle (28.2%) and knee (25.8%) and for hits were the foot (38.6%) and toe (34.7%). The most common types of injury for falls were strain or sprain (30.6%) and fracture (29.8%) and for hits were laceration (25.5%) and contusion or abrasion (24.2%). The average patient was age 65 years or older for 28.9% of falls and 12.5% of hits and was female for 75.5% of falls and 64.2% of hits. The most common activities in falls were tripped over the cat (63.4%), chasing/trying to catch the cat (9.9%), and feeding/watering the cat (4.2%), and in hits were chasing/trying to catch the cat (27.8%), cat knocked object over/turned object on (24.4%), and assaulted/teased/scared the cat (actual or attempted) (7.0%).

Conclusion: Numerous differences were found in the pattern of cat-related falls and hits affecting the lower extremity. These differences should be taken into consideration in efforts to prevent such injuries.

Cats are the second most popular pet in the United States (US). The 2023-2024 American Pet Products Association National Pet Owners Survey reported that 46.5 million US households owned a cat, as compared to 65.1 million US households that owned a dog.[1]

Interactions with cats may result in injury. Bites might be the first type of injury that comes to mind, and thousands of cat bites are treated at US hospital emergency departments (EDs) each year.[2,3] However, cats are also a source of falls. A study using data from a sample of US hospital EDs during 2001-2006 found an estimated 62,000 nonfatal unintentional fall injuries involving cats.[4] The most common type of injuries (diagnoses) were fractures, contusions or abrasions, strains or sprains, and lacerations. The falls occurred during a variety of circumstances: walking pet, caring for pet, playing with pet, chasing pet, running from pet, running with pet, breaking up pet fight, stepping over pet, and attacked by pet.

This previous study also reported that one-fifth of the cat-related fall injuries involved the leg or foot.[4] The objective of the current study was to describe cat-related falls affecting the lower extremity treated at US hospital EDs. Cat-related hits affecting the lower extremity also were described and compared to cat-related falls.

Methods

This study used data from the National Electronic Injury Surveillance System (NEISS), which are available at https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx. The NEISS database has previously been described in detail in *Lower Extremity Review*.[5] In brief, operated by the US Consumer Product Safety Commission (CPSC), NEISS is a database of consumer product- and activity-related injuries collected from a representative sample of approximately 100 US hospital EDs. National estimates are calculated from database records according to the sample weight assigned to each case based on the inverse probability of the hospital being selected for the NEISS sample.[6,7] Data are publicly available and de-identified; thus, the study is exempt from institutional review board

Table 1. Cat-related falls and hits affecting the lower extremity, National Electronic Injury Surveillance System, 2000-2023, by body part and injury type

Variable	Fall		Hit	
	Estimate	Percent	Estimate	Percent
Body part				
Ankle	12,732	28.2	590	5.0
Knee	11,671	25.8	538	4.5
Foot	7,484	16.6	4,597	38.6
Lower leg	5,919	13.1	1,248	10.5
Toe	4,146	9.2	4,135	34.7
Upper leg	3,267	7.2	801	6.7
Injury type (diagnosis)				
Strain or sprain	13,817	30.6	389	3.3
Fracture	13,474	29.8	2,604	21.9
Contusion or abrasion	9,365	20.7	2,883	24.2
Laceration	3,094	6.8	3,039	25.5
Other/not stated	5,471	12.1	2,993	25.1
Total	**45,220**		**11,909**	

Fall = the record mentioned a fall, trip, slip, jump down.

Hit = hit or other contact with object (fall, trip, slip, jump down not mentioned).

Estimate = Weighted estimate (sum of the Weight numeric field in the National Electronic Injury Surveillance System database). The numbers in the Weight field are not whole numbers but include decimals. As a result of rounding to whole numbers when performing analyses, the sum of the estimates for a given variable might not equal the total. The Consumer Product Safety Commission considers an estimate unstable and potentially unreliable when the estimate is <1,200.

approval. The previous study that examined cat-related fall injuries used data from a related database (National Electronic Injury Surveillance System – All Injury Program or NEISS-AIP).[4] The NEISS-AIP has been described previously in *Lower Extremity Review*.[8]

Cases were cat-related falls and hits affecting the lower extremity reported to NEISS during 2000-2023. The identification of cases was performed in stages. First, to identify as many cat-related injuries as possible, the NEISS database was searched for all records that mentioned a cat in the Narrative field (a text field that provides a brief summary of the circumstances and type of injury). A search for the letter group "cat" was not performed because the letter group is included in a number of different words (e.g., catch, dislocation, intoxication) and would have produced too many false positives. Instead, a search was performed for all records that included the following letter groups and spaces or punctuation in the Narrative field:

" cat " or "cat " [at the beginning of the text] or " cat" [at the end of the text] or "cat." or ".cat" or "cat," or ",cat" or "cat;" or ";cat" or "cat-" or "-cat" or "cat/" or "/cat" or "cat\" or "\cat" or "cat's" or "cats" or "kitten" or "kitty"

It is acknowledged that some cat-related injuries will be missed, primarily due to misspellings.

Next, the resulting records were individually reviewed to identify those records that appear to involve a cat-related *fall* or hit. A record was classified as a fall if the record mentioned a *fall, trip, slip, or jump down*. The record did not need to state that the patient landed on the ground but could have landed on or contacted another object (eg, patient fell into a chair). A record was classified as a *hit* if the record mentioned a *hit or other contact with an object* (e.g., patient was playing with a cat and hit their hand on a table,

Continued on page 26

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Table 2. Cat-related falls and hits affecting the lower extremity, National Electronic Injury Surveillance System, 2000-2023, by activity or circumstance

Activity or circumstance*	Fall		Hit	
	Estimate	Percent	Estimate	Percent
Tripped over the cat	28,687	63.4	-	-
Chasing/trying to catch the cat	4,491	9.9	3,306	27.8
Cat knocked object over/turned object on	122	0.3	2,911	24.4
Avoided stepping on/hitting the cat	1,907	4.2	700	5.9
Feeding/watering the cat	1,910	4.2	198	1.7
Move/carry//pick up/put down/reach for the cat	1,664	3.7	399	3.3
Assaulted/teased/scared the cat (actual or attempted)	0	0.0	833	7.0
Playing with the cat	358	0.8	691	5.8
Other/unknown	5,191	11.5	2,872	24.1
Total	**45,220**		**11,909**	

Please see full footnote on Table 1.

*Listed activities accounted for >3% of either falls or hits. Circumstances accounting for <3% of falls and hits were included in the Other/Unknown group.

patient was chasing the cat and stubbed their toe on a chair, patient was chasing the cat and stepped on a nail, cat knocked a vase off a shelf and the vase hit the patient in the head). If the patient hit or contacted an object and the record mentioned a fall, trip, slip, or jump down, the record was classified as a fall.

At the same time as the above action, the record was assigned to 1 of 44 activities or circumstances resulting in the injury (eg, tripped over the cat, chasing/trying to catch the cat, cat knocked object over/turned object on).

Finally, those cat-related falls and hits affecting the lower extremity were identified. The NEISS database contains 2 numeric fields for coding the affected body part (Body_Part and Body_Part_2) and 2 related numeric fields for coding the type of injury or diagnosis (Diagnosis and Diagnosis_2). The Body_Part_2 and Diagnosis_2 fields were added in 2018, although they do not appear to have been used until 2019.[7] For consistency over the entire study period, the Body_Part and Diagnosis fields alone was examined for the analysis. Only those records where the Body_Part field contained codes for a lower extremity (upper leg, knee, lower leg, ankle, foot, toe) were included in the study.

The variables examined were body part, injury type (diagnosis), treatment year and month, location where the incident occurred, activity or circumstance resulting in the injury, patient age and sex, and disposition. Analyses were performed using Microsoft 365 Access and Excel (Microsoft Corporation, Redmond, Washington, US). National injury estimates were calculated by summing the values in the Weight numeric field in the publicly available NEISS database. The distribution of estimated injuries was calculated for each variable for falls and hits. The CPSC considers an estimate unstable and potentially unreliable when the estimate is <1,200.[6]

Results

There were an estimated 45,220 cat-related falls affecting the lower extremity, representing 19.3% of the estimated 234,027 cat-related falls affecting all body parts. There were an estimated 11,909 cat-related hits affecting the lower extremity, representing 31.9% of the estimated 37,347 cat-related hits affecting all body parts.

Table 1 presents the distribution of cat-related falls and hits affecting the lower extremity by body part and type of injury (diagnosis). For falls, the most affected body parts were the ankle and knee; for hits, the most affected body parts were the foot and toe. The most common type of injury for falls was strain or sprain followed by fracture, contusion or abrasion, and laceration. For hits, the order of the type of injury was reversed.

Supplemental Table 1 (which appears online only) shows the distribution of cat-related falls and hits affecting the lower extremity by time period and location of incident. For both falls and hits, the estimated number of injuries increased over the period of the study, the highest proportion of injuries were treated during July-September, and the majority of injuries occurred at home.

The most common activity or circumstance in cat-related falls affecting the lower extremity

Continued on page 28

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Table 3. Cat-related falls and hits affecting the lower extremity, National Electronic Injury Surveillance System, 2000-2023, by patient demographics and disposition

Variable	Fall		Hit	
	Estimate	Percent	Estimate	Percent
Age group (years)				
0-5	542	1.2	753	6.3
6-12	1,427	3.2	1,317	11.1
13-19	3,325	7.4	1,336	11.2
20-29	5,738	12.7	2,235	18.8
30-39	6,398	14.1	1,753	14.7
40-49	7,443	16.5	1,769	14.9
50-59	7,256	16.0	1,258	10.6
60-69	5,980	13.2	836	7.0
70-79	3,634	8.0	268	2.2
80+	3,476	7.7	384	3.2
Sex				
Female	34,135	75.5	7,646	64.2
Male	11,085	24.5	4,263	35.8
Disposition				
Treated and released, or examined and released without treatment	40,237	89.0	11,404	95.8
Treated and admitted for hospitalization (within same facility)	4,419	9.8	368	3.1
Treated and transferred to another hospital	362	0.8	57	0.5
Left without being seen/Left against medical advice	202	0.4	64	0.5
Not recorded	0	0.0	16	0.1
Total	**45,220**		**11,909**	

Please see full footnote on Table 1.

was tripped over the cat (Table 2). (By definition, none of the cat-related hits involved tripped over the cat.) The next most common activities or circumstances in falls were chasing/trying to catch the cat, feeding/watering the cat, and avoided stepping on/hitting the cat. The most common activities or circumstances in cat-related hits affecting the lower extremity were chasing/trying to catch the cat, cat knocked object over/turned object on, and assaulted/teased/scared the cat (actual or attempted).

When patient demographics and disposition were examined (Table 3), the highest proportion of cat-related falls affecting the lower extremity involved patients age 40-49 years, and 28.9% of the estimated injuries involved patients age 60 years or older. The highest proportion of cat-related hits affecting the lower

extremity involved patients age 20-29 years, and 12.5% of the estimated injuries involved patients age 60 years or older. For both falls and hits, most patients were female, although this proportion was higher for falls than for hits. As for disposition, the majority of patients were treated or examined and released from the ED, although this proportion was greater for hits than for falls (Table 3). Patients were treated and admitted for hospitalization (within same facility) or treated and transferred to another hospital, for 10.6% of the estimated falls and 3.6% of the hits.

Discussion

The study examined cat-related falls and hits affecting the lower extremity treated at US hospital EDs. An estimated 46.5 million US households own a cat, making cats the second most popular pet in the US.[1] With so many cats, cat-related injuries are likely to occur. Falls are a common cause of injury that can have serious consequences. A previous study reported that thousands of cat-related falls are treated at US hospital EDs each year.[4] However, this previous study only examined a 6-year period and included injuries affecting all body parts. The current study examined a 24-year period and focused on injuries affecting the lower extremity. Moreover, in addition to investigating cat-related falls, the current study investigated cat-related hits. A search of the literature could not find a similar study.

Both cat-related falls and hits affecting the lower extremity increased over the 24-year study period. This increasing trend may be due to an increase in the number of cats in households. However, information on trends in the number of cats in the US is inconsistent. According to surveys by the American Veterinary Medical Association (AVMA), 31.6% of US households owned cats in 2001, 32.4% in 2006, 30.4% in 2011, and 25.4% in 2016. The estimated US cat population was 81,721,000 in 2006, 74,059,000 in 2011, and 58,385,725 in 2016. This suggests that the US household cat population is declining.[9] However, another data source based on a national pet owners survey reported that the number of cats in the US increased from 73 million in 2000 to 94.2 million in 2017.[10] Other potential explanations for the increase in cat-related falls and hits affecting the lower extremity include an increase in the overall number of cat-related falls and hits, an increase in in the tendency for people experiencing cat-related falls and hits to seek treatment at a hospital ED, and/or an increase in hospital coders mentioning that a cat was involved in a fall or hit when filling out the Narrative field in a NEISS record.

A slight seasonal pattern was observed among both cat-related falls and hits affecting the lower extremity, with the highest proportion of estimated injuries reported during July-September. It may be that, during the summer months, people are somewhat more likely to have interactions with cats that lead to falls and hits.

Aside from the time trends and the observation that the majority of injuries occurred at home, cat-related falls and hits affecting the lower extremity differed in a number of ways. While the most affected body parts for falls were the ankle and knee, the most affected body parts for hits were the foot and toe. In addition, the most common types of injury for falls were strain or sprain followed by fracture, contusion or abrasion, and laceration; for hits, the order of the injuries was reversed. These differences are likely due to differences in the mechanism of falls and hits that lead to injury.

The most common activities or circumstances in cat-related falls affecting the lower extremity were tripped over the cat (which, by definition, only apply to cat-related falls), chasing/trying to catch the cat, feeding/watering the cat, and avoided stepping on/hitting the cat. In contrast, the most common activities or circumstances in cat-related hits affecting the lower extremity were chasing/trying to catch the cat, cat knocked object over/turned object on, and assaulted/teased/scared the cat (actual or attempted). These suggest that certain cat-related activities are more likely to result in falls and others to result in hits.

Patients with cat-related falls affecting the lower extremity tended to be older, with patients age 60 years or older comprising 29% of cat-related falls but only 12% of cat-related hits. Moreover, although the majority of patients with both cat-related falls and hits were female, this proportion was higher for falls than for hits. Age is one of the key risk factors for falls. Older adults have the greatest risk of serious injury or death relating to falls, and the risk increases with age.[11,12] Furthermore, ED visits related to falls are more common in children younger than 5 years of age and adults age 65 years or older.[13] Females also are at greater risk of falls than males.[11,12] Similar information is not readily available on hits.

While most patients of cat-related falls and hits affecting the lower extremity were treated or examined and released from the ED, this proportion was greater for hits than for falls. In addition, a higher proportion of patients with cat-related falls than with hits (11% vs 4%) were treated and admitted for hospitalization (within same facility) or treated and transferred to another hospital. This is probably related to differences in the patterns of patients and injuries observed between falls and hits. Older patients and those with more serious injuries may be more likely to require hospital management beyond the ED.

A previous study published in *Lower Extremity Review* examined dog-related falls affecting the lower extremity.[14] The dog-related falls were similar to cat-related falls in many respects. Cat-related falls affecting the lower extremity accounted for 19.3% of total cat-related falls; dog-related falls affecting the lower extremity accounted for 20.5% of total dog-related falls. For both cat-related and dog-related falls, the estimated number of injuries increased during 2000-2023, the highest proportion of injuries occurred during July-September, approximately one-quarter of the patients were age 60 years or older and three-quarters were female, and most of the incidents occurred at home. With respect to disposition, the majority of cat-related and dog-related fall patients were treated or examined at the ED and released (89.0% and 89.5%, respectively) although approximately 10% of the patients (10.6% and 9.6%, respectively) were treated and admitted for hospitalization (within same facility) or treated and transferred to another hospital. The most

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common types of injury with cat-related and dog-related falls were strain or sprain (30.6% and 33.1%, respectively), followed by fracture (29.8% and 28.8%, respectively), contusion or abrasion (20.7% and 19.1%, respectively), and laceration (6.8% and 5.5%, respectively). The only difference between cat-related and dog-related falls was the distribution of affected body parts. For cat-related falls, the most affected body part was the ankle (28.2%) followed by the knee (25.8%). For dog-related falls, the most affected body part was the knee (33.3%) followed by the ankle (29.3%).

There are ways to reduce the risk of cat-related falls and hits affecting the lower extremity. Prevention activities include increasing public awareness about situations that can lead to such falls and hits. Such prevention activities should take into account the differences between cat-related falls and hits.

There are limitations to this study. The data source was NEISS. NEISS primarily collects data on consumer product- and activity-related injuries treated at US hospital EDs. Therefore, only those cat-related falls and hits affecting the lower extremity considered to be related to consumer products or activities would be included in the study, a subset of all cat-related falls and hits affecting the lower extremity. However, the general pattern of cat-related falls affecting the lower extremity found in the present study was similar to the pattern of cat-related falls found in a study that used data from the NEISS-AIP database, which is not limited to consumer product and activity-related injuries.[4]

Another limitation was that cat-related falls and hits were first identified by searching the record Narrative field for specific letter groups and spaces or punctuation. If the Narrative field for a record of a cat-related fall or hit injury did not include any of these, it would not be included in the study. Also, further selection of records to be included in the study and the sorting of them into the various activities resulting in injury was performed by a single person and was based on the Narrative field, which contains a limited amount of information that at times was difficult to interpret. Errors in the selection and classification of records may have resulted in records being included or excluded erroneously or misclassified. Finally, only those cat-related falls and hits affecting the lower extremity treated at hospital EDs were included in the study. The number of such injuries not seen at EDs is unknown.

In conclusion, the estimated number of cat-related falls and hits affecting the lower extremity and treated at US hospital EDs has increased over the last 24 years. There were numerous differences in the pattern of cat-related falls and hits, which should be taken into consideration in prevention activities. ler

Mathias B. Forrester, BS, is an independent researcher in Austin, Texas. Now retired, he previously performed public health research for various university and government programs for 38 years.

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Precision Healing: The Art & Science of Matrix Products in Lower Extremity Wound Care

By Cassandre Voltaire, DO

Wound care is an evolving science, but if there's one lesson I've learned, it's this: healing isn't just about using the latest product—it's about knowing *when and how* to use it.

Early in my career as a family physician, I saw a number of chronic wounds stagnate despite standard treatments. Patients were frustrated. So were we. The limitations of traditional approaches were clear, but what wasn't clear was how to bridge the gap between persistence and progress.

It wasn't until I transitioned fully into wound care that I had my epiphany: precision matters more than intervention. The right product, applied at the right time, can turn a stalled wound into one that finally heals. Among the tools that have revolutionized wound care, cellular, acellular, and matrix-like products (CAMPs) stand out—not as a cure-all, but as a finely tuned instrument in the hands of those who understand their use.

Understanding CAMPs: Engineering the Body's Healing Blueprint

CAMPs are not just advanced dressings. They are bioengineered scaffolds that mimic the extracellular matrix (ECM)—the skin's natural support system. By providing a structure that promotes cellular migration, angiogenesis, and granulation tissue formation, CAMPs create an environment conducive to healing.

But the effectiveness of CAMPs doesn't come from simply applying them. Matching the right product to the right wound at the right time is essential. This is something I learned firsthand from a patient whose case taught me the importance of timing and precision.

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A Case of Precision: The Right Choice at the Right Time

One patient with a diabetic foot ulcer stands out in my memory. His ulcer had been stagnant for months despite standard treatments like offloading, debridement, and dressings. He was understandably frustrated.

Instead of immediately reaching for an advanced product, we took a step back. We optimized his hyperglycemia and addressed vascular insufficiency, ensuring his wound was in the best possible state for healing. Once his wound was stable and free from infection, we used a bilayered bioengineered matrix product—not as a last resort, but as a deliberate, well-timed choice.

> The right product, applied at the right time, can turn a stalled wound into one that finally heals.

The difference was remarkable. Within 6 weeks, granulation tissue filled the base, epithelialization was progressing, and—most importantly—his hope was renewed. It was a powerful reminder that CAMPs are not a one-size-fits-all solution. Their success depends on timing, preparation, and precise application.

This case reinforced what I've come to believe: CAMPs work, but only when the wound is truly ready.

Choosing the Right CAMP for the Right Wound

CAMPs come in different forms, each with unique benefits:

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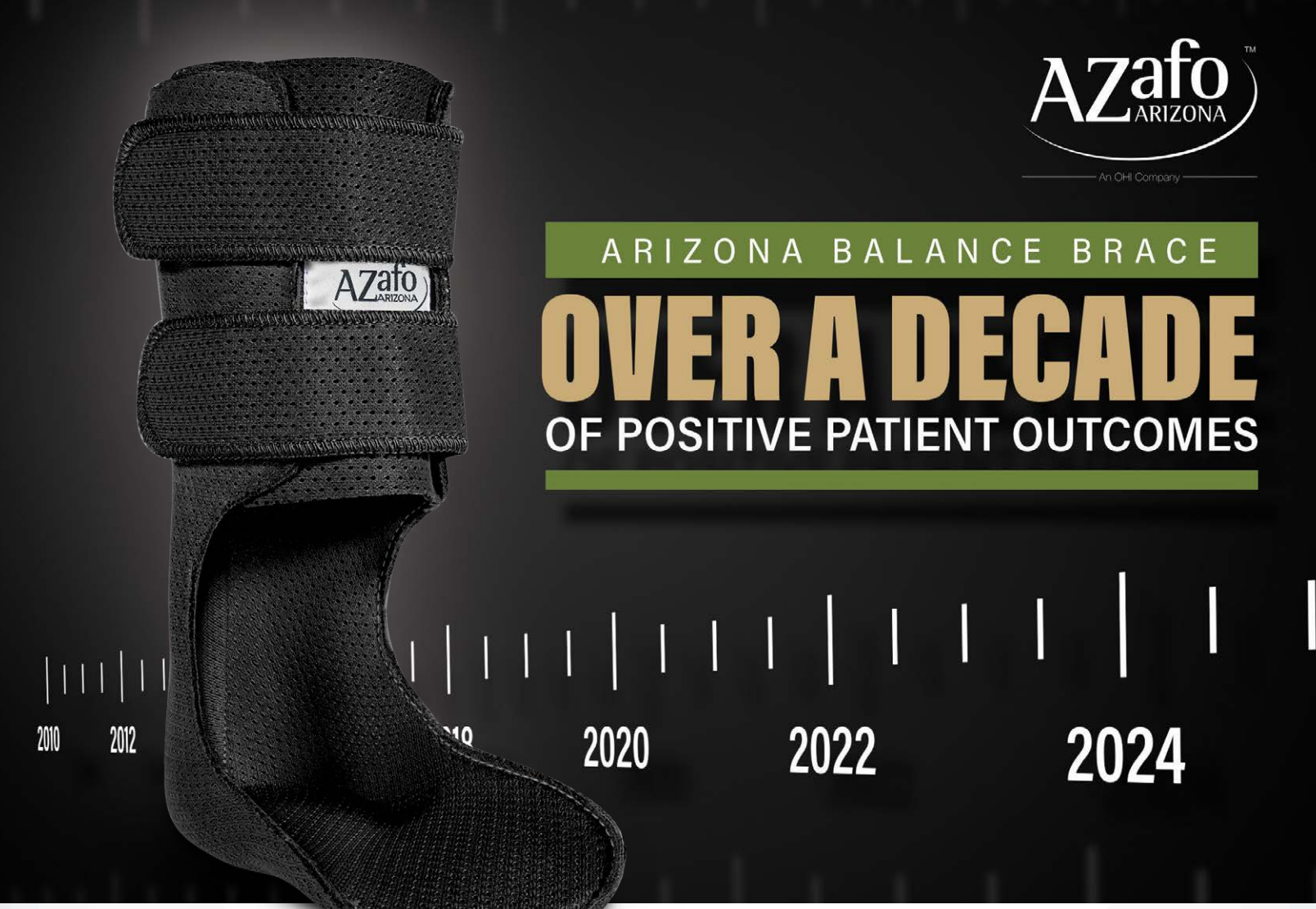

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- **Human Skin Allografts** – Derived from cadaveric skin, these retain growth factors that promote regeneration.
- **Allogeneic Matrices – Created from human tissue, designed to support chronic wound repair.**
- **Composite Matrices** – A blend of living cells and scaffolds, often using xenogeneic collagen to enhance healing.
- **Acellular Matrices** – Structural scaffolds from human, porcine, or bovine sources that provide a framework for cellular infiltration and tissue regeneration.

Choosing the right CAMP isn't about following a strict formula. It requires understanding each product's strengths and how they align with the wound's needs. In my practice, I've seen how the right choice can make a dramatic difference in healing outcomes.

Where CAMPs Shine

From my experience, CAMPs are particularly effective for:

- **Venous Leg Ulcers (VLUs)** – Often combined with compression therapy for better results.
- **Diabetic Foot Ulcers (DFUs)** – Particularly effective when standard treatments fail.
- **Complex Chronic Wounds** – Including pressure ulcers, burns, and surgical wounds, where emerging evidence supports their use.

However, despite their potential, the use of CAMPs is complicated by more than just clinical considerations.

Navigating Reimbursement and Policy Challenges

Two significant challenges often limit the use of CAMPs:

1. Reimbursement Limitations – Local Coverage Determinations (LCDs) cap the number of CAMP applications for DFUs and VLUs, which can limit access. Originally set to take effect this year, these LCD changes have now been delayed until April 13, 2025. This delay presents an opportunity to advocate for policies that better align with patient needs.

To justify the use of CAMPs, clinicians must provide thorough documentation, including wound history, prior treatments, and measurable outcomes.

2. Documentation Demands – To justify the use of CAMPs, clinicians must provide thorough documentation, including wound history, prior treatments, and measurable outcomes.

The regulatory landscape is complex, but staying informed and advocating for fair policies is crucial for ensuring that patients have access to the best available treatments.

Lessons Learned: Precision Matters

Reflecting on my journey with CAMPS, 3 key insights stand out:

- **Timing and Precision** – The right product at the wrong time won't work. Assessing the wound's readiness is just as important as selecting the product itself.
- **Advocacy Is Essential** – With LCD changes on the horizon, clinicians must engage in policy discussions to ensure patient access to these innovative therapies.
- **Holistic Care Comes First** – Even the most advanced CAMP can't replace vascular optimization, offloading, infection control, and comprehensive patient-centered care.

CAMPs are more than just innovative products – they represent an opportunity to heal smarter and with greater precision, ensuring patients receive the most appropriate care at the right time. When used wisely, they remind us of the ultimate goal: transforming lives, one wound at a time.

Cassandre Voltaire, DO, is a wound care physician specializing in advanced wound management and chronic wound healing. Based in Massachusetts, she combines her background in family medicine with holistic and evidence-based wound care. She is also the founder of WoundFit, dedicated to empowering healthcare providers with accessible wound care education and resources.

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Introducing the 12 Dirty Truths Playbook: A New LER Series In Biomechanics and CAGA

By Jay Segel, DPM; Sally Crawford, MS

The medical field continues to experience rapid technological advancements, providing us with critical graphs and quantitative measurements that validate what we see, the qualitative findings. For healthcare professionals charged with understanding and addressing gait, recognizing the correlation of what happens during weightbearing and the challenges/costs to the musculoskeletal system is key. We now have sophisticated tools that offer detailed insights into the specific events, positionings, and timing of said events. Pressure analysis, a long-standing and valuable tool for podiatrists, orthopedic surgeons and physical therapists, should be considered an integral part of the history and physical of a patient concerned with musculoskeletal maladies. The ability to precisely measure and analyze data is crucial for diagnostic clarity and developing personalized treatment plans, further improving patient outcomes and advancing medical research at accelerated speeds.

The study of biomechanics is understanding that physical events happen at specified times and in a specific order. With the help of synchronized computers, sensors, and video, we can now quantify those gait patterns we used to just view qualitatively.

We define Computer Aided Gait Analysis (CAGA) in this way: A set of tools and components used to capture the way a person functions using technology to record and store patient specific data which can be examined and compared to normative data and evaluated therapeutic care plan efficacy.

Quantitative data via CAGA significantly enhances our understanding of human locomotion, driving innovation in diagnostic and therapeutic techniques. By embracing these advancements, healthcare professionals can offer the highest standard of care, leveraging precise measurements and analyses to improve patient outcomes in an increasingly data-driven world. Simply put, each article in this multi-part "column" will be filled with numerous golden nuggets for utilization of CAGA today and through the future. To that end, article number one is an introduction to the series with a tangent on movement toward the future, one none of us can avoid. At least to some degree.

Figure: On the left we have children at play, seemingly care free; on the right, we find a gathering of sedentary seniors in a nursing home riddled with foot and gait complaints and missing limbs.

Mechanical maladies occur more often as we age as is evidenced by the documented use of medical services by an increasingly right shifted patient population. What has happened to our bodies, mechanically, as we age, is the result of a different kind of duel between 2 dissimilar bodies. This phenomenon is known medically as repetitive microtrauma, known more simply as wear and tear. The interaction between a 3-dimension foot of limited mass and a 2-dimension support surface of relatively unlimited mass is outcome easily defined by the laws of collision dynamics.

As we like to say, "it is a battle the foot doesn't win, and it doesn't win that battle millions of times a year"… and we carry the consequences of this war. We attack this principal dirty truth and the others herein, through use of CAGA tools and the integration of data for the benefit of our patients and with respect to our partners throughout the entire care teams. CAGA is imaging medicine required to see the body in motion throughout aging.

Through each article we will provide you with the tips to finally get to the root causes with computer aided gait analysis quantifying motion. You can't manage what you can't measure – quantification is key. Neither can you communicate, map, or monitor progress, or lack thereof, with precision and certainty.

So, please look forward to getting golden nuggets each month on CAGA concepts, that relate to your practice and the advancements, as

well as journey to the next generation. The Dirty Truths include:

1. **Problematic anatomy: The foot isn't symmetrical**
2. **It's a physics problem: Walking, running, and weight-bearing**
3. **Computers are key, gait can't be quantitated by eye alone**
4. **Shock absorption is energy loss**
5. **We pronate and supinate in the normal gait cycle**
6. **Elastic to plastic – feet age**
7. **Wear and tear over time - repetitive microtrauma and age**
8. **Every step is different**
9. **Fashion and idiocy**
10. **Bottom up and top down – understanding the kinetic chain**
11. **Cooperative & Collaborative communication with patient and care team**
12. **What we do matters**

Jay Segel, DPM, is a Podiatrist, Biomechanist, Orthotic and Gait Analysis Specialist, in Martha's Vineyard, MA.

Sally Crawford, MS, is a Biomedical Engineer, IT director, and data manager.

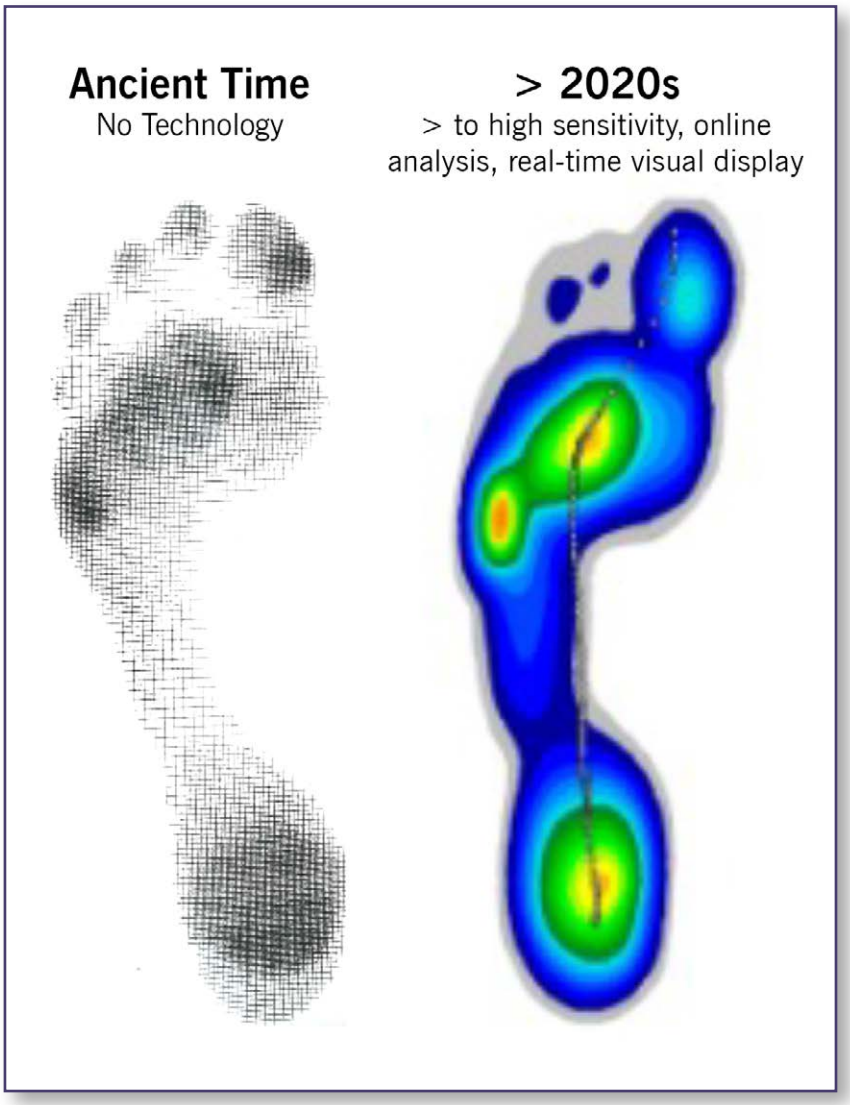

Figure: As we progress towards the future, technology becomes imperative—but luckily, data quality improves and the understanding that comes with it is unavoidable.

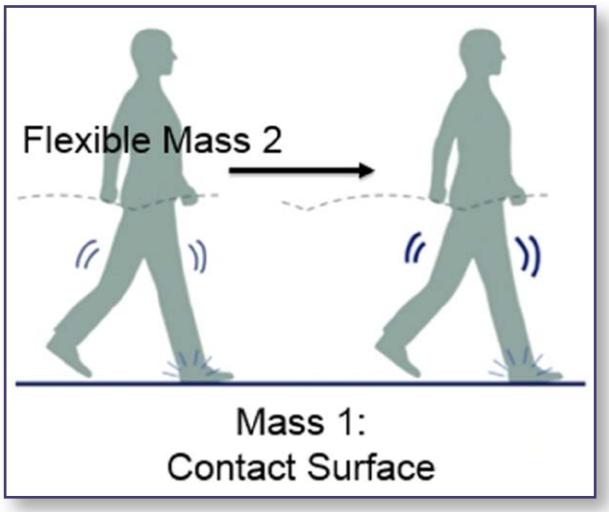

Figure: Laws of collision dynamics

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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.

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- Calluses
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- Capsulitis
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- Warts
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- Lesions
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- Fat Pad Atrophy
- Bone Spurs
- Metatarsalgia
- Sensitive Areas
- Friction Zones
- Diabetic Hot Spots
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PediFix® Medical Footcare

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STAND-ON-COMMAND MOBILITY RIDER

VertaCat is a new all-terrain mobility rider that lifts people with limited mobility into a standing position, enabling challenged walkers to play golf and other sports again. Made in the United States, VertaCat's electric stand-up assist system provides padded chest, waist, and knee straps that securely lift the user into an upright stance where they can grab a golf club with 1 or 2 hands. After consultation with golfers who have disabilities, VertaCat offers a steepness-warning accelerometer, pivot-in-place positioning technology, turf-friendly tires, and anti-jerk acceleration for a smooth ride on the course. Golfers with mobility challenges will appreciate details such as the fold-out arm rests that move out of the way and steering that accommodates the availability of a single hand. A 58v lithium phosphate battery will last for an 18-hole round of golf, even on a hilly course.

VertaCat
612/804-6399
vertacat.com

NEW PROSTHETIC FOOT INSPIRED BY THE HUMAN ANATOMY

The new SoftFoot Pro is a motorless, flexible, waterproof prosthetic foot that is inspired by the anatomy of the human extremity. Designed by the Istituto Italiano di Tecnologia (IIT, Italian Institute of Technology), Genoa, its design is unique on an international level and aims to serve both as a flexible technological prosthesis for people with limb loss and as a solution for humanoid robots of the future.

Weighing about 450 grams, it can support loads of up to 100kg. It consists of a mobile arch mechanism in titanium (or aeronautical-grade aluminum alloy), whose ends are connected by 5 high-strength plastic chains arranged in parallel to simulate the plantar fascia of human feet. These chains are traversed lengthwise by a high-performance, mechanically inextensible cable of 210mm, connected at the heel. Each chain is characterized by multiple modules made of high-strength plastic that are linked by pairs of elastics. The arch system and the elastic chains constitute the artificial equivalent of the architecture composed by the tarsus, metatarsus, and phalanges of the human foot.

Because of its flexibility, SoftFoot Pro perfectly reproduces the natural positions assumed by human feet and allows for performing everyday actions such as bending down to tie a shoe or picking something up from the ground, and improving the user's ability to ascend and descend stairs. Image courtesy of IIT-Istituto Italiano di Tecnologia.

This architecture allows the replication of the windlass mechanism, which progressively stiffens the plantar fascia to evenly distribute the force applied on the ground during walking, which contributes to more efficient negotiation with obstacles, better forward propulsion, and improved energy efficiency. The adaptable and elastic feature of the sole helps with absorbing approximately 10–50% of the impact on the ground.

Moreover, the foot sole deforms and adapts to uneven terrain and obstacles, thus minimizing them, improving the naturalness of the step, and enhancing the stability of the user. SoftFoot Pro is designed to be used on uneven terrain, including slippery grounds, where it is typically more challenging for prosthetic users, and for robots, to maintain balance. Being waterproof makes it adequate to be used outdoors, on grass, beaches, and slippery terrain, avoiding the need for the user to switch to activity-specific prostheses.

SYNTHETIC PLUGS OFFER ALTERNATIVE TO TOTAL KNEE REPLACEMENTS

A synthetic cartilage-capped regenerative osteochondral plug being implanted into a knee. Image courtesy of Texas A&M Engineering.

Osteochondral defects (OCDs) can cause damage to cartilage and underlying bone, leading to chronic pain and loss of joint function. Depending on the extent of damage, individuals must undergo surgical treatment, the most extensive being total knee replacement. Toward this end, Melissa Grunlan, PhD, a professor in the Department of Biomedical Engineering at Texas A&M University, received a grant from the National Institute of Arthritis and Musculoskeletal and Skin Disease to develop synthetic cartilage-capped regenerative osteochondral plugs (CC-ROPs)—a potential off-the-shelf surgical device to treat OCDs. This technology could be an alternative to current treatment methods, such as autografting or total knee replacement.

The proposed CC-ROPs are not restricted by age or the size of the defect while offering other benefits. Firstly, they were designed to have the geometry of cylindrical autografts so they could be implanted with existing surgical

tools and protocols. Additionally, they do not require pre-loading with cells or growth factors to induce healing, but instead leverage the unique features of the cap and scaffold base. Once implanted, the CC-ROP can provide immediate support for joint function, including knee articulation.

The CC-ROP consists of a cartilage cap and an osseous base. The cartilage cap is an ultra-strong hydrogel that uniquely mimics the mechanical properties of biological cartilage. The base is made of a porous, bioresorbable polymer. After implantation, the base is replaced by new bone tissue and continues to anchor the cartilage cap. Thus, the cylindrical implant stimulates the formation of new bone tissue and integration with host tissue while supplying synthetic cartilage necessary for joint function.

REVITALIGN GAIA SNEAKERS FOR MEN

The Revitalign® Gaia athletic walking shoe for men is expertly crafted to deliver unmatched comfort, stability, and orthotic support for active lifestyles. The sneaker is designed to meet the diverse needs of men seeking style, foot health, and performance in 1 shoe. Marking Waco Shoe Company's debut in fitness-oriented walking shoes for men, the Gaia features an engineered outsole, responsive cushioning, and 360-degree orthotic support, making it an optimal choice for anyone dedicated to staying active and healthy. The sneaker is available in a range of colors—black, grey, navy, and white—and sizes from 7 to 14 in both medium and wide widths. The shoe's cushion-driven design and Ortho-Stretch 3D knitted upper offer extra flexibility for foot ailments like bunions, making it perfect for extended wear.

Waco Shoe Company
844/827-0439
WacoShoeCompany.com

FLEXIBLE SKIN SENSOR DETECTS BIOMARKERS, OFFERS HOPE FOR NONINVASIVE DISEASE MONITORING

The sensor comprises an ionic electronic bilayer hydrogel that can detect solid state biomarkers from the skin. It is connected to a flexible printed circuit board which transmits data wirelessly to a user interface. Image courtesy of NUS Institute for Health Innovation & Technology.

Researchers from the National University of Singapore (NUS) and the Agency for Science, Technology and Research (A*STAR) have developed a novel sensor, which is produced using a scalable and cost-effective manufacturing process called screen printing. It enables the continuous, real-time detection of solid-state epidermal biomarkers (SEB)—a new category of health indicators. The research team's innovation offers a noninvasive method to monitor health by detecting biomarkers directly on the skin. These biomarkers, which include cholesterol and lactate, are found in the outermost layer of the skin and have shown strong correlations with diseases such as cardiovascular disease and diabetes. However, detecting these biomarkers directly has been difficult.

The team's wearable, stretchable, hydrogel-based sensor overcomes the limitations of current methods that rely on biofluid samples, such as blood, urine, and sweat. This makes it a promising alternative for wearable, continuous, and real-time health monitoring, as physiological data is transmitted wirelessly to an external user interface via a flexible printed circuit board, making it valuable for remote patient monitoring. It can also efficiently monitor athletes' lactate levels, an indication of exhaustion and tissue hypoxia, which affect their performance.

In clinical studies, the sensor demonstrated strong correlations between the biomarkers detected on the skin and those found in blood samples. This validates the sensor's accuracy and reliability, suggesting it could be an alternative to blood tests for monitoring chronic diseases such as diabetes, hyperlipoproteinemia, and cardiovascular conditions. The sensor's sensitivity is another advantage, as it can detect solid-state lactate and cholesterol at very low levels. Additionally, the sensor's design reduces motion artefacts—which occur when the user's movements affect the placement of the sensor or its contact pressure to the skin—by 3 times compared to conventional counterparts. By minimizing disruptions caused by movement, the bilayer hydrogel ensures consistent and reliable readings, while the stretchable, skin-like nature of the device enhances user comfort.

ENOVIS ADDS EMPOWR™ CONES TO EMPOWR REVISION KNEE™ SYSTEM

Enovis™ has redefined revision knee surgery by expanding its EMPOWR Revision Knee™ system to include EMPOWR™ Cones. The

addition of the stackable tibial, femoral, and diaphyseal cones increases options for treating bone defects, creating a comprehensive portfolio to support complex revision needs. The US Food & Drug Administration cleared use of the EMPOWR Cones with the EMPOWR Revision Knee. The EMPOWR Revision Knee system is designed to streamline revision procedures yet provide a comprehensive setup, which reduces clutter in the operating room while allowing surgeons to fine-tune the implant fit to each patient. EMPOWR's femoral and tibial stackable augments can be used both medially and laterally to minimize excess inventory. With the addition of the EMPOWR Cones, surgeons are better able to tailor revision surgeries with a modernized workflow and no decision fatigue.

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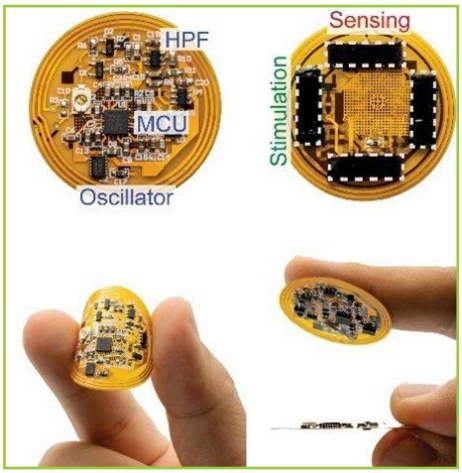
SMART BANDAGE CAN DETECT HOW A WOUND IS HEALING



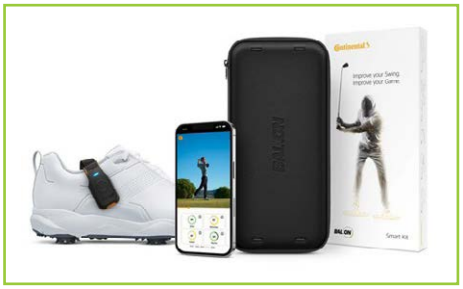
Photographs of the smart bandage showing the MCU, crystal oscillator, high-pass filter (HPF), stimulation and sensing electrodes, flexibility of the printed circuit board, adhesion of the hydrogel interface to skin, and thin layout of the board. Image courtesy of Jian-Cheng Lai, Bao Group at Stanford University.

Researchers at Stanford University report that they have developed a wireless smart bandage that has shown promise in speeding up tissue repair by monitoring the wound healing process and treating the wound simultaneously. The researchers said that their device promotes faster closure of wounds, increases new blood flow to injured tissue, and enhances skin recovery by significantly reducing scar formation.

The smart bandage is composed of wireless circuitry that uses impedance/temperature sensors to monitor the progression of wound healing. By monitoring biophysical changes in the local environment, it can provide a real-time, rapid, robust, and extremely accurate way to measure wound condition. If the wound is less healed or an infection is detected, the sensors inform a central processing unit to apply more electrical stimulation across the wound bed to accelerate tissue closure and reduce infection. The researchers were able to track the sensor data in real time on a smartphone, all without the need for wires.

The electronic layer, including a microcontroller unit, radio antenna, memory, electrical stimulator, biosensors, and other components, is about the thickness of a single coat of latex paint. All that circuitry rides atop a cleverly engineered hydrogel—a rubbery, skin-like polymer—that is integrated to both deliver healing electrical stimulation to the injured tissue and collect real-time biosensor data. The polymer in the hydrogel is designed to adhere securely to the wound surface when needed, yet pull away cleanly and gently without harm to the wound when warmed to just a few degrees above body temperature (40°C/104°F).

GOLF TRAINING INSOLES



Continental's BAL.ON Smart Kit provides golfers with real-time swing analysis and coaching using 2mm-thin pressure-sensing insoles and an artificial intelligence (AI)–powered smartphone app, to efficiently guide users to a better swing and lower scores. The kit consists of a pair of pressure insoles that are inserted into the golf shoes, Bluetooth smart pods, and a smartphone app. Relying on pressure data and AI, it provides real-time analysis and coaching. BAL.ON captures information invisible to human eyes.

Good swing technique involves interacting with the ground. The BAL.ON heatmap shows the user how they shift their weight during the golf swing. Quite literally, it unveils the footprint of their motion, as the feet mark the beginning of the golf swing's kinetic chain. This chain goes throughout the entire body. Consequently, pressure patterns can help spot where the user differs from the "corridor of the ideal" in their motion.

Continental
contact@bal-on.golf
bal-on.golf

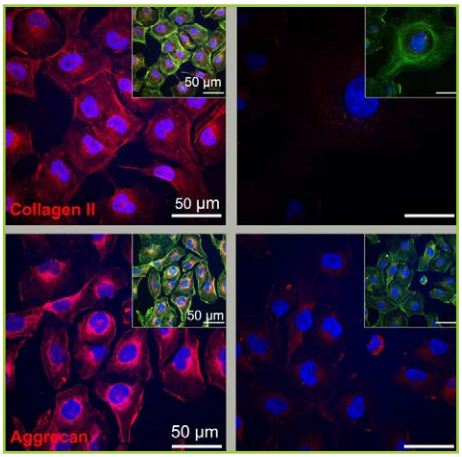
ENERGY BOOSTING INFRARED SOCKS

The Cadense Energy Boost Performance sock is made using Hologenix's CELLIANT proprietary minerals. When embedded into socks, CELLIANT captures body heat and converts it into infrared (IR) energy—to increase local circulation and cellular oxygenation—which is reflected back into the foot and lower leg. The

result is enhanced thermoregulation, reduced muscle soreness, and faster recovery after physical activity. While anyone can benefit from IR light therapy via wearing these socks, the circulation benefits are particularly helpful for people who spend a lot of time on their feet or need extra support. The socks feature a cushioned heel and toe for extra comfort, lightweight and breathable fabric for all-day wear, reinforced wear points for improved durability, and gentle compression to support circulation and reduce fatigue. The socks are made from 34% polyester, 30% Celliant® rPet, 30% cotton, 4% rubber, and 2% Spandex, ensuring a blend of comfort, durability, and performance.

Cadense
805/225-7765
cadense.com

DANCING MOLECULES HEAL CARTILAGE DAMAGE



Cartilage cells generate more protein components (collagen II and aggrecan) for regeneration when treated with fast-moving dancing molecules (left) compared to slower moving molecules. Image courtesy of Stupp Research Group/Northwestern University.

In November 2021, Northwestern University researchers introduced an injectable therapy, which harnessed fast-moving "dancing molecules," to repair tissues and reverse paralysis after severe spinal cord injuries. Now, the same research group has applied the therapeutic strategy to damaged human cartilage cells. The treatment was shown to activate the gene expression necessary to regenerate cartilage within 4 hours. And, after 3 days, the human cells produced protein components needed for cartilage regeneration. Their work has implications for patients suffering from osteoarthritis.

The researchers also found that, as the molecular motion increased, the treatment's effectiveness also increased. In other words, the molecules' "dancing" motions were crucial for triggering the cartilage growth process. Dancing molecules are assemblies that form synthetic nanofibers comprising 10s to 100s of thousands of molecules with potent signals for cells. By tuning their collective motions through their chemical structure, the researchers discovered the moving molecules could rapidly find and properly engage with cellular receptors, which also are in constant motion and extremely crowded on cell membranes. Once inside the body, the nanofibers mimic the extracellular matrix of the surrounding tissue. By matching the matrix's structure, mimicking the motion of biological molecules and incorporating bioactive signals for the receptors, the synthetic materials are able to communicate with cells.

The researchers are currently testing these systems in animal studies and adding additional signals to create highly bioactive therapies. They are also testing the ability of dancing molecules to regenerate bone—and already have promising early results.

GENIUM X4 MICROPROCESSOR KNEE

Genium X4 is the next generation of Ottobock's Genium family of prosthetic microprocessor knees (MPKs). Building on the proven Optimized Physiological Gait (OPG) technology and rugged durability of its predecessors, the MPK offers improvements in user experience across a wide range of challenging professional and everyday situations. The new OPG 3.0 features an array of updates, including Optimized Slope Ascent, Start-to-Walk, Early Stance Phase Support, and Dynamic Backward Movement,

to deliver a smooth, near-natural gait. With the new intuitive cycling feature, the knee joint recognizes the start and end of pedal movement and dynamically adjusts resistance, without the user having to activate a MyMode preset. The MPK is waterproof and corrosion-resistant. It boasts a battery life of up to 5 days, and allows for 5 MyMode presets that professionals can tailor to the user's preferred activities. The new connectgo.pro app enables O&P professionals to make extensive adjustments during the fitting.

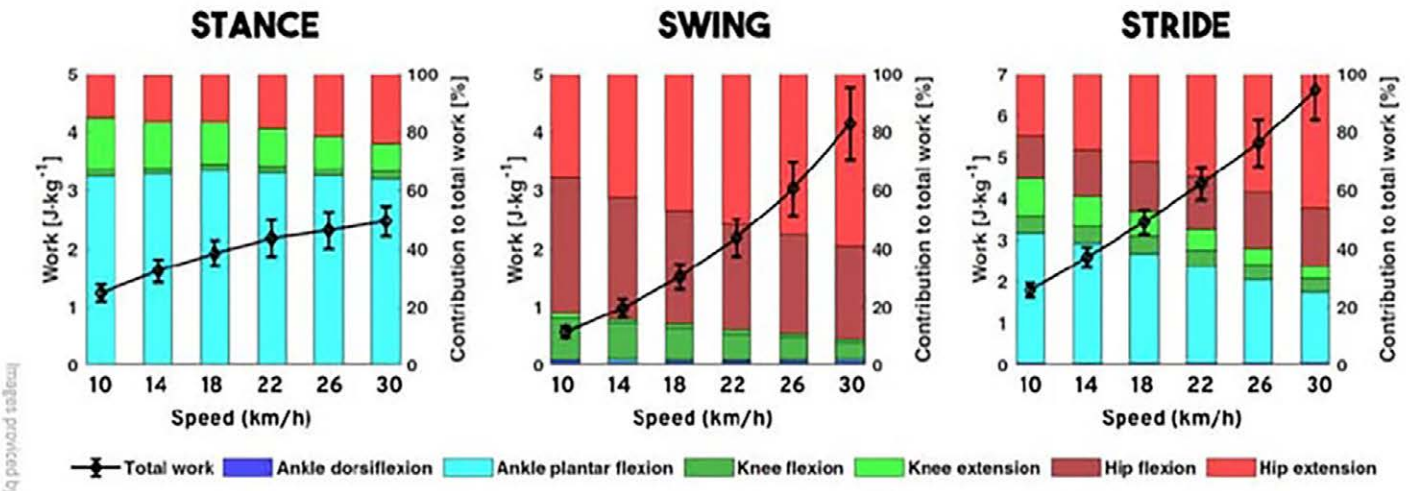
Ottobock
800/328-4058
ottobock.com

HOW HUMANS RUN FASTER

Reference et al. : Willer et al. SJMSS 2024

Designed by @YLMSportScience

Eleven male middle-distance runners were tested on an instrumented treadmill to characterize the contributions of functional muscle groups to running at six wide-ranging speeds (10–30 km/h)



Images provided by PresenterMedia

- These results reinforce the importance of the plantar flexors for running at ≤18 km/h, as they made the largest contribution of any muscle group, not just during stance, but also to whole stride positive and negative work (45%–35%), despite their relatively modest size.
- Large speed-dependent changes meant that at >29 km/h the largest contributors to the work of a running stride were the hip extensors (positive work) and knee flexors (negative work), which concurs with the importance of these muscle groups for sprint performance and the high incidence of hamstrings injury in sprint athletes.
- These findings support the importance of long-distance athletes conditioning the plantar flexors, and sprint athletes conditioning the hip extensors and knee flexors for enhancing performance and mitigating injury risk.

Source: Willer J, Allen SJ, Burden RJ, Folland JP. How Humans Run Faster: The Neuromechanical Contributions of Functional Muscle Groups to Running at Different Speeds. Scand J Med Sci Sports. 2024;34(8):e14690. doi: 10.1111/sms.14690.

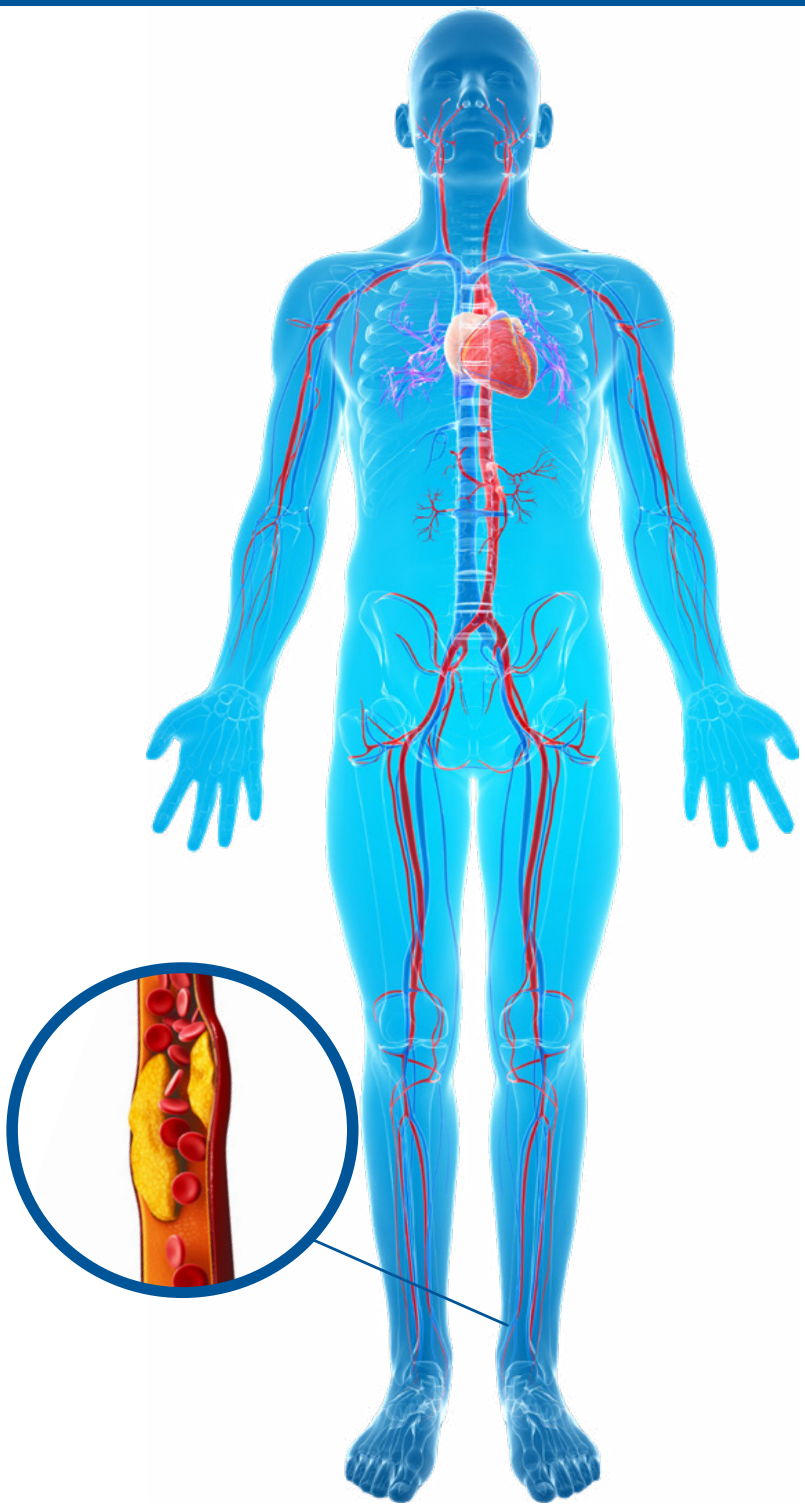
Peripheral Artery Disease

Peripheral Artery Disease (PAD) is a deadly chronic condition that can lead to heart attack, stroke, or amputation.

1 in 3

- » Diabetics age 50+
- » Smokers age 50+
- » Everyone age 70+

Have PAD



$390 billion

annual US healthcare costs attributable to PAD

100,000 amputations

of lower extremities in the US annually, due to vascular disease

Market-Tested
Over One Million Tests Performed
Market-Trusted

Biomedix is a market leader in PAD diagnostics, delivering products and services that feature a cloud-based platform enabling community-based collaborative care.

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