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LOWER EXTREMITY REVIEW

June 17 / volume 9 / number 6

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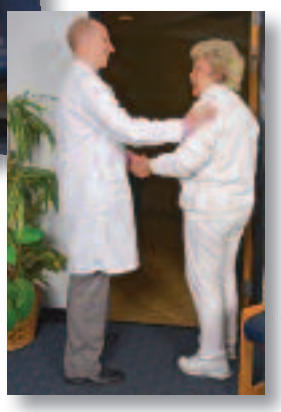

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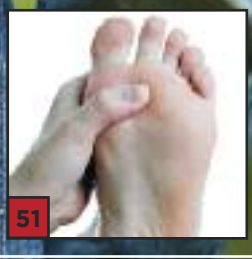
Next-level thinking in O&P:
Coverage of the 2017 ISPO World Congress



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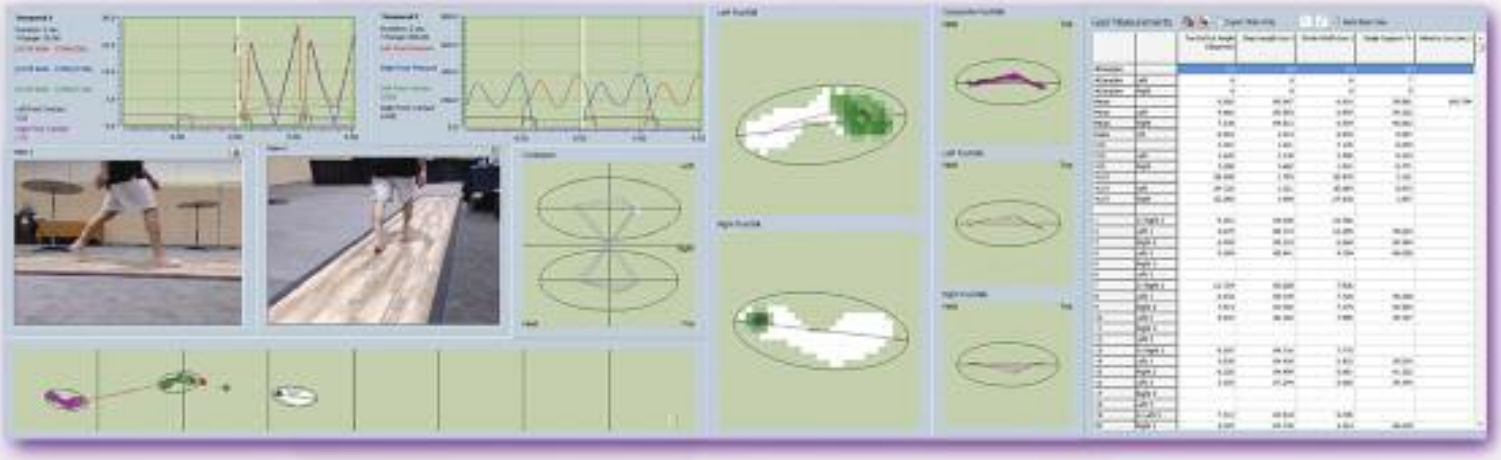

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out on a limb: Valuable testimony

A person's testimony doesn't always agree with objective evidence—that's why some defense attorneys won't allow their clients to take the stand during a trial, even in their own defense. Similarly, as most clinicians know, patient-reported outcomes aren't always consistent with objective measures of function.

But that doesn't necessarily mean subjective patient information should be discounted. In fact, the most effective patient care may require consideration of both types of outcome measures.

Lower extremity clinicians working with patients who wear ankle foot orthoses (AFOs) to improve balance and mobility are familiar with this type of dichotomy, as illustrated by a presentation in May at the 2017 International Society of Prosthetics & Orthotics (ISPO) World Congress in Cape Town, South Africa (see "Next level thinking in O&P: Coverage of the 2017 ISPO World Congress," page 27).

A growing body of research—as well as clinical experience—supports the concept of "tuning" AFOs, in combination with a patient's footwear, to customize device alignment for each patient in ways that will optimize balance and mobility.

So, it's not surprising that when researchers from the Philippines analyzed the effects of tuned and untuned rigid AFOs in 14 patients who were at least six months poststroke, patients' scores on the Berg Balance Scale and Timed Up and Go test were significantly better with AFOs than with shoes only in the tuned group, but not in the untuned group.

It would seem logical that the improvement in static and dynamic balance associated with the tuned AFOs would translate to improved balance confidence. But patient-reported scores on the Activity-specific Balance Confidence (ABC) scale told a different story: ABC scores were significantly better with AFOs than with shoes only for the untuned group, but not the tuned group. Mean ABC scores with AFOs were also higher for the untuned group than the tuned group, though that difference was not statistically significant.

Granted, this was a pilot study, with a small number of participants, and it was not designed to look at within-subject differences between the tuned and untuned AFO conditions. But it's also not entirely surprising that self-reported balance confidence improved more with the untuned AFOs, even though static balance and dynamic balance were improved to a greater extent with the tuned AFOs.

> Patient testimony isn't necessarily part of a good legal strategy. But it can help make a good AFO tuning strategy even better.

As *LER* has reported, other studies—not to mention clinicians' experience—also suggest that patients may be uncomfortable in tuned devices even if their balance and function are significantly improved (see "AFO tuning: Balancing function and satisfaction," August 2014, page 27). And patients who aren't comfortable in tuned AFOs aren't likely to wear them, regardless of the potential biomechanical advantages.

Such patients may be reluctant to voluntarily mention any device-related discomfort; it may be easier for them to express those concerns in a questionnaire. That's why doing both subjective and objective assessments can help clinicians recognize patients who may need a little more time or assistance in adjusting to tuned AFOs.

Patient testimony may not necessarily be part of a good legal defense strategy. But it can help make a good clinical strategy even better.

Jordana Bieze Foster, *Editor*

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ACLR aftershocks

Deficits linger after return to sports

By Jordana Bieze Foster

Several studies presented in early June at the American College of Sports Medicine (ACSM) annual meeting in Denver add to the growing body of research suggesting some biomechanical deficits linger for a year after anterior cruciate ligament reconstruction (ACLR), even in athletes who have been cleared to return to sports.


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The findings underscore several aspects of the ongoing discussion among researchers and clinicians regarding ways to reduce rates of subsequent ACL injuries in athletes: the need to refine rehabilitation goals and strategies after ACLR, to reevaluate existing return-to-sports criteria, and to investigate more closely the question of how much time is really required for complete ACL healing.

Symmetry between the reconstructed limb and the contralateral limb is often used to determine an athlete's readiness to return to sports, but three ACSM presentations reported significant between-limb asymmetries during the first year following unilateral ACLR.

Researchers from Virginia Polytechnic Institute and State University in Blacksburg analyzed movement and loading symmetry during a vertical stop-jump task in 23 adolescent athletes (14 girls), all of whom were cleared to return to sports six months after ACLR and discontinued physical therapy at that time.

They found significant between-limb asymmetries for knee extension moment, peak vertical ground reaction force, and impulse at 12 months after ACLR; symmetry improvements that were seen between four and six months appeared to plateau after that time.

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Plantar sensation fails to explain shift in foot strike during barefoot running

Sensory feedback research from Colorado appears to challenge the popular belief that barefoot runners tend to adopt a forefoot-strike pattern to avoid the discomfort of landing on an unprotected heel.

Investigators from Fort Lewis College in Durango, CO, and Denver Health Medical Center analyzed the gait of 10 healthy active young adults as they ran overground on a 20-m runway.

Trials were performed barefoot and shod and under normal sensory conditions and with the plantar surface of the foot anesthetized using lidocaine injected under the metatarsals, lateral column, and heel.

Without anesthetic, barefoot running was associated with a shorter stride length, a nonrearfoot-strike pattern, and reduced loading compared with shod running. However, those differences persisted even after the lidocaine was applied. The findings, presented in late May as a poster at the American College of Sports Medicine annual meeting in Denver, suggest that superficial cutaneous sensory receptors do not play a significant role in the gait changes associated with barefoot running. ler

Source:

Thompson MA, Hoffman KM. Superficial sensory feedback is not responsible for gait alterations associated with barefoot running. Med Sci Sports Exerc 2017;49(5 Suppl 1):S100.

NHL study adds to evidence linking concussion, lower body injury risks

A study of National Hockey League (NHL) injuries adds to the evidence suggesting concussion significantly increases the risk of lower body injury in athletes, and vice-versa.

Researchers from the University of Michigan in Ann Arbor compiled time-loss injury information for four NHL regular seasons from hockey-reference.com and public news reports. These included 141 reported concussions and 900 lower body injuries.

Players whose first injury during the study period involved the lower body had a three times higher risk of a concussion during the same season than players without lower body injuries. Players whose first injury was a concussion had a 2.25-times higher risk of a lower body injury during the same season than those with no concussions.

By comparison, players whose first injury involved the lower body had a 1.5-times higher risk of a second lower body injury during the same season, according to Kathryn L. O'Connor, a doctoral student in the university's NeuroTrauma Research Laboratory, who presented the findings in early June at the American College of Sports Medicine annual meeting in Denver. ler

Source:

O'Connor KL, Bhargava T, Lapointe AL, Broglio SP. National Hockey League players' concussion and lower-body injury risk across the 2012-2015 seasons. Med Sci Sports Exerc 2017;49(5 Suppl 1):S644.

Continued from page 13

"There's still something we're leaving on the table during therapy that we need to be focusing on," said Robin M. Queen, PhD, an associate professor of biomedical engineering and mechanics at Virginia Tech and director of the university's Kevin P. Granata Biomechanics Laboratory.

Researchers from Children's Hospital Los Angeles also found that between-limb asymmetries persisted when assessed six to 10 months after ACLR in adolescent athletes, despite improvement relative to an assessment between three and six months after ACLR.

In 24 athletes (14 girls), the investigators found that asymmetries in sagittal plane kinematics and kinetics during a vertical drop-jump landing improved between the two visits but remained statistically significant at the second visit.

Although rehab after ACLR tends to focus on the magnitude of maximum force generation as an outcome measure, a study from the University of Wisconsin-Madison (UWM) supports the increasingly popular belief that rate of force development may also be important.

In 18 collegiate athletes (10 women) an average of seven months removed from ACLR, investigators analyzed rate of force development in the quadriceps, hamstrings, and gluteal muscles during a countermovement jump and a treadmill run, and found significant between-limb asymmetries.

"Our findings suggest we should consider rapid force activation during rehabilitation after ACLR," said Daniel Cobian, PhD, DPT, CSCS, a postdoctoral scholar in the university's Department of Orthopedics and Rehabilitation Science, who presented his group's findings at the ACSM meeting. "Rate of force development may be more related to real-world activity than maximum force."

Fear of reinjury, which can impede rehabilitation and return to sports after ACLR, also appears to have effects on biomechanics years after surgery, according to another UWM study.

Investigators used the Tampa Scale of Kinesiophobia-11 to assess 59 female adolescents with a history of unilateral ACLR (mean time from surgery 25.5 months), and divided them into tertiles for high, medium, and low fear of injury. Those in the highest tertile demonstrated stiffer jump-landing hip and knee mechanics than those in the lower tertiles.

"We need to try to identify fear of injury during rehab and implement interventions," said Stephanie Trigsted, PhD, ATC, an athletic trainer and doctoral candidate in the Department of Kinesiology-Biomechanics, who presented the findings at the ACSM meeting. ler

Sources:

Queen RM, Miller TK. Limb asymmetry during anterior cruciate ligament reconstruction recovery. Med Sci Sports Exerc 2017;49(5 Suppl 1):S373.

Katzel M, Pace JL, Mueske N, et al. Biomechanical asymmetries in drop jump improve during rehabilitation following ACL reconstruction in adolescents. Med Sci Sports Exerc 2017;49(5 Suppl 1):S373-374.

Cobian DG, Knurr KA, Stiffler MR, et al. Reduced rates of quadriceps activation during running and jumping in collegiate athletes post-ACL reconstruction. Med Sci Sports Exerc 2017;49(5 Suppl 1):S374.

Trigsted SM, Post E, Schaefer D, et al. The effect of fear of reinjury on biomechanics during a jump landing following ACL reconstruction. Med Sci Sports Exerc 2017;49(5 Suppl 1):S374.

Forward progress on falls

Studies explore risk factors, intervention

By Jordana Bieze Foster

The multiple factors that contribute to the risk of falls in older adults present a complicated clinical puzzle, but researchers are making progress on putting some of those pieces together, as evidenced by several studies presented in late May and early June at the American College of Sports Medicine (ACSM) annual meeting in Denver.


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Presented findings suggest walking aids and arthritis can affect risk of falling in some older adults, and that strength and balance as risk factors may be age-dependent. And though researchers don't yet fully understand every aspect of the various risk factors that can contribute to falling, evidence also suggests that a multimodal, high-intensity exercise program addresses enough of those factors to significantly improve the risk of falling in sedentary older adults after just four weeks.

Researchers from New Mexico State University in Las Cruces analyzed the percentage of the gait cycle spent on propulsion—which tends to be higher in individuals with a history of falls—in 254 adults older than 60 years, 90 of whom reported having fallen in the previous year.

In the group of nonfallers, individuals who used a walking aid (such as a cane or walker) or self-reported a diagnosis of arthritis spent significantly longer in propulsion than other nonfallers. However,

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Ankle proprioception in older adults diminishes to level of adolescents

Ankle proprioception peaks in young adulthood, and in elderly individuals—even the healthiest—declines to levels similar to those of adolescents, according to research presented in early June at the American College of Sports Medicine annual meeting in Denver.

Investigators from the University of Canberra in Australia and Shanghai University of Sport in China analyzed ankle proprioception in 20 children (aged 6-8 years), 20 adolescents (13-15 years), 20 young adults (18-25 years), and 20 older adults (65-82 years) using the AMEDA (active movement extent discrimination assessment) test. The older adults were active, in good cognitive health, and had no history of falling.

Among the groups, the mean area under the curve for AMEDA accuracy was lowest in the children and highest in the young adults. Scores for the older adults were significantly lower for the young adults, and similar to those of the adolescents. Given the robust nature of the older adult study participants, the findings suggest ankle proprioception in less-active older adults or those with comorbidities is of even greater concern. ler

Source:
Yang N, Waddington G, Adams R, Han J. Age-related changes in ankle proprioception. Med Sci Sports Exerc 2017; 49(5 Suppl 1):S394.

Carbon-fiber AFOs help propel patients with PAD while preserving calf muscle

Use of carbon-fiber ankle foot orthoses (AFOs) assists with propulsion in patients with peripheral arterial disease (PAD) without compromising calf muscle integrity, according to research from the University of Montana in Missoula.

Investigators enrolled 15 patients with PAD and a history of intermittent claudication (mean age, 67 years) who were fitted with bilateral carbon-fiber AFOs and advised to wear them during daily activities. The researchers assessed gait mechanics while the patients walked at a self-selected speed with and without AFOs after one week of accommodation to the devices, and again after 12 weeks of use.

AFO use was associated with reduced peak ankle plantar flexion power during propulsion, which could help reduce intermittent claudication in patients with PAD, but—surprisingly—no change in calf muscle recruitment. In the 12 patients who completed both assessments, gait parameters after 12 weeks were similar to those seen at the initial testing session.

The findings were presented in early June at the American College of Sports Medicine annual meeting in Denver. ler

Source:
Mizner RL, Mays AA, Mays RJ. Mechanical adaptations in walking performance using ankle foot orthoses for patients with peripheral artery disease. Med Sci Sports Exerc 2017;49(5 Suppl 1):S441.

Continued from page 15

these variables did not affect time in propulsion for those with a history of falls.

"Interventions to improve percentage of time in active propulsion may include balance training, strength training, and mobility training," said Eryn Murphy, MS, CSCS, an instructor in the Department of Kinesiology and Dance, who presented her group's findings at the ACSM meeting.

Interventions to improve balance and reduce the risk of falls in older adults often involve strengthening exercises, but research from the Shanghai University of Sport in China suggests that strength and balance decline at different ages.

Investigators analyzed performance on clinical tests of strength and balance in 48 women aged between 60 and 89, who were subdivided into three age groups: younger than 65 years, 65 to 74 years, and 75 years and older.

Although only the oldest group demonstrated declines in hand strength, mediolateral sway with eyes closed declined in both of the two oldest groups; most of the other variables assessed, including lower extremity strength, decreased linearly with increasing age. Upper and lower extremity strength were significantly correlated with dynamic balance (assessed using the Timed Up and Go test) but not with static postural sway measures.

"Different exercises may be needed at different ages," said Yuanyuan Tian, a researcher in the university's department of physiotherapy, who presented her group's findings at the ACSM meeting.

In developing an intervention to reduce the risk of falls in older adults, Italian researchers reported at the ACSM meeting that they have been successful using a multimodal approach rather than trying to address individual risk factors.

Investigators from Catholic University Sacred Heart in Rome randomized 30 sedentary adults aged 70 years and older, defined as being at high risk for falls according to the Berg Balance Scale (BBS), to four weeks of an exercise intervention or to a control group.

Those in the intervention group exercised three times a week for 75 minutes per session. The program emphasized dual-task performance, balancing on foam mats under different conditions, and strength training using free weights and elastic bands.

After the training, the intervention group had improved from 10.9% to 23.8% compared with baseline on all six components of the Balance Evaluation Systems Test, and all were considered no longer at risk for falling based on BBS score. The control group demonstrated no changes. ler

Sources:

Murphy E, Keeley DW, Wood R. Walking aid use and arthritis: Impact on time spent in active propulsion in older adults. Med Sci Sports Exerc 2017;49(5 Suppl 1):S131.

Tian Y, Han J, Zhu J, et al. Limb strength and balance in community-dwelling older women. Med Sci Sports Exerc 2017;49(5 Suppl 1):S512-S513.

Sgadari A, Martina A, Battaglioli A, Burnabei R. Effects of a short, intensive, multi-component physical exercise program in the elderly at risk of falls. Med Sci Sports Exerc 2017;49(5 Suppl 1):S513.

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Slacklining:

Trendy sport takes balance training to new heights

As slacklining's popularity grows, researchers have begun to uncover physiological and neurological evidence for how and why the activity may be beneficial to people with balance, strength, and mobility issues.

By Brigid Elsken Galloway

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Dakota Collins found that slacklining helped address balance and strength deficits related to his being born with clubfoot (left, center); clubfoot was also responsible for his right foot being two sizes smaller than his left as an adult (right). (Photos courtesy of Dakota Collins.)

Dakota Collins sways precariously as he walks along a narrow nylon strap suspended a few feet off the ground. The strap bounces like a trampoline beneath his feet. He sways his arms from side to side and above his head. At any moment you think he might fall, until you realize he isn't flailing his arms. He is using them to find his balance—and balance has been the impetus behind Collins' remarkable rehabilitation. This is slacklining.

Watching the agile 23-year-old cross the slackline, you would never guess that he was born with a clubfoot. Collins spent the first four years of his life with his right leg in a cast. His right foot is two sizes smaller than his left, and until he began slacklining, his right leg was also significantly smaller than the left, with less muscle tone. His shoulders tilted from the resulting scoliosis. Although early surgery and medical intervention helped correct his gait, his posture was altered after years of compensation. Slacklining changed that.

"It helps keep my body balanced," Collins said. "It has done amazing things for me physically, mentally, and spiritually. Now I can't really tell a difference between my left and my right sides."

Collins grew up in Fort Collins, CO, spending a lot of time outdoors. He was drawn to slacklining about five years ago and was surprised to discover it was a "legit sport." For him, it has become a practice (like yoga or meditation) to help improve concentration, balance, and overall physical fitness. Although Collins is now adept at highlining—an extreme version of the sport performed hundreds of feet off the ground—he introduces his students to a much less intimidating version, just a few inches off a tumbling mat.

As owner of Rocky Mountain Slackline, Collins teaches slackline techniques and travels around the world performing and promoting the sport. He is not a physical therapist, but he shares his experience with school children and physical therapists.

"Keeping my shoulders up and controlling the balance of my arms allowed me to walk better because I was much more aware of my body," he says. "It changed my need to compensate for my right leg and I was able to build muscle in my right leg."

Slacklining basics

Although it resembles tightrope walking, the distinction of slacklining is that participants balance on a 2-inch wide, flat nylon strap that's strung with less tension than a tightrope to give it bounce. The sport is said to have originated in the mid-'80s in California's Yosemite Valley by climbers who were looking for ways to improve their balance.[1] Then, in 2012, Andy Lewis' slacklining performance at the Super Bowl halftime show (starring Madonna) propelled the activity into the spotlight.[2]

Slacklines cropped up on college campuses and in parks, predominately for recreation among teens and young adults. Recent slackline festivals have been held in Brazil, Sweden, Turkey, Poland, and France. In the US, Austin, TX; Richmond, VA; Vail, CO; and Spencer, IN, host annual events. Wherever there is open space and two poles, trees, or other anchors, a slackline may be found—and on it, a person who desires to defy, if not gravity, then his or her own sense of balance.

Collins is now adept at highlining, an extreme version of slacklining. (Photo courtesy of Dakota Collins.)

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Megan's a blade runner

After her accident and amputation, Megan wondered if she'd ever run again. Her prosthetist knew that once she had healed, there was a way to give her a far better outcome.

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Clinical applications

Only in the past 10 years have researchers begun to uncover physiological and neurological evidence for how and why slacklining may be beneficial to people with balance, strength, and mobility issues.

In 2010, a seminal slackline study[3] published by Martin Keller, PhD, a lecturer in the Department of Medicine, Unit Sports Science, at the University of Fribourg in Switzerland, demonstrated that as little as four weeks of slackline training was associated with improved balance in 12 healthy adults.

Before training, no study participants were able to maintain balance on the slackline for 20 seconds. After training two to four times a week, 90 minutes per session, for a total of 10 sessions, they were able to balance unassisted on the slackline for at least 20 seconds, as well as perform a variety of tasks, such as walking the line or catching a ball while balancing on the line. After training, Hoffman reflexes (H-reflexes) were significantly diminished compared with baseline values in the slackline group, and had not changed in the 12-person control group, which did no training.[3] Keller and colleagues also found that the participants in the slacklining group demonstrated improvement from baseline in dynamic postural stability, assessed using a device with a multiaxial free-swinging platform.

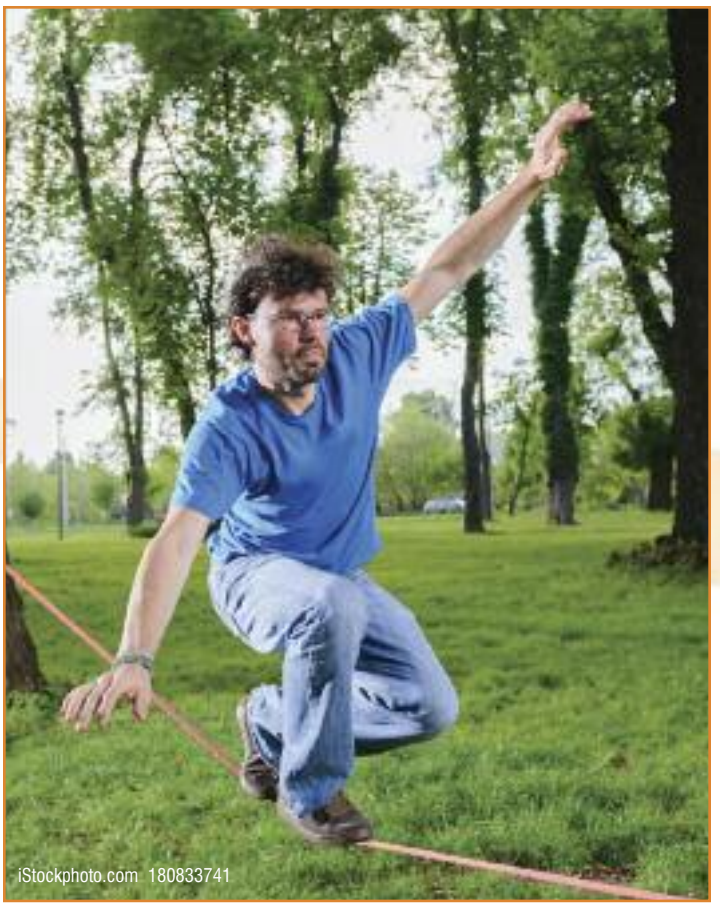
Although the authors noted that similar improvements have been associated with other forms of balance training,[4-7] there were two distinctions. First, unlike traditional balance therapy that relies heavily upon the circumjacent ankle joint, Keller found that slacklining activates muscle groups of the ankle, knee, and hip joints simultaneously. Second, anecdotally, the authors observed that participants found slacklining more enjoyable and motivating than classic balance training.

"What you have with the slackline is the unique ability of the brain to tap into the primary or fundamental balance reaction," said Philip Gabel, PhD, PT, a research fellow at Griffith University in Queensland, Australia. "That's something that can't be achieved in a lot of activities. It's one of the most mind-blowing areas of potential research and rehabilitation in the last 30 years."

More than 10 years ago, Gabel used slackline therapy to help world-class Australian surfer Julian Wilson. At that point, slacklining had been recognized as a rehabilitation tool for surfing and skiing, but little formal academic research existed. Gabel decided to change that. He was one of the first to conduct scientific research on the therapeutic benefits of slacklining. He has since authored, co-authored, and contributed to numerous studies on its use for therapeutic purposes among various patient populations.

In 2013, Gabel and colleague Simon Mendoza, PT, at Bern Physical Therapy in Switzerland, created a four-stage, 20-step protocol for slacklining training progression so that it could be used more widely for rehabilitation and injury prevention.[8] The progression stipulates beginning with a band suspended only a few centimeters above a soft surface as participants gradually complete a series of simple standing positions, followed by movement on the band.

Gabel and colleagues then studied quadriceps activation in a group of 49 men and women with various knee injuries, including osteoarthritis, injuries to the medial collateral ligament and patellofemoral joint, and postoperative menisectomy.[9] The participants completed five separate quadriceps exercises in a clinical setting at a self-perceived effort of a strong to maximal contraction.



These exercises included two traditional open-chain exercises, two traditional closed-chain exercises, and Gabel and Medoza's composite-chain staged slacklining protocol with the slackline anchored at a length of 3 m and a height of 25 cm. The researchers assessed quadriceps activation after each of the exercise conditions.

"The distinction is that slacklining is that it is a three-dimensional, composite-chain exercise," Gabel said. "The slackline is fixed at one end, but it moves in three dimensions. That's where it's unique and not just a simple toy. It doesn't work the same way as most of the balance or rehab tools, like balance boards or bongo boards."

The study found the slackline activity yielded higher quadriceps activation than the other four activity groups, while the perceived effort during slackline activity was significantly lower. But the body-mind connection that slacklining taps into was more directly explored in subsequent studies with older patients who experienced cognitive impairment due to progressive disorders.

Another 2016 study conducted at the University of Oviedo and the University of A Coruña, both in Spain, found slacklining may be a valid cross-training tool for female basketball players.[10]

Special populations

More recently, Gabel and colleagues pioneered the use of slacklining as a rehabilitation modality in a clinical setting for stroke. Their 2016 case study[11] involved an 87-year-old stroke patient who experienced reduced lower limb muscle activation in her right leg, hypertonia, and concurrent postural deficits. Specifically, she exhibited right lower limb weakness, mildly reduced sensation, and reduced balance and general limb control with tonal changes.

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A year after her stroke, the benefits of traditional physical therapy had plateaued. In fact, at this point, the patient had experienced three falls after her mobility began to regress. Enter slackline therapy, consistent with the first two stages of the aforementioned protocol. The patient's functional status improved within two months and was sustained after six months of therapy. The authors concluded that slacklining's external stimulations activated global-body responses through innate balance and reflex modulations, in addition to activation of the lower limb muscles and trunk core muscles.[11]

Likewise, research coauthored by Gabel[12] involving individuals with Parkinson disease (PD) suggested that slacklining could be used as a safe and effective means of physical therapy. The study consisted of 20 patients with idiopathic PD, 10 of whom were randomized to perform 12 additional 23-minute balance training sessions using a slackline over six weeks (two sessions per week on nonconsecutive days). The remaining 10 patients formed a control group and followed their usual physical activity routine for the study period.

The sessions included a 10-minute warm-up off the slackline, eight minutes of slackline tasks, and a five-minute cool down. The slackline setup was 300 cm long and 30 cm high. Mats were placed beneath the line for safety. Participants were guided through four training blocks, alternately balancing on the left and right legs and in tandem stance with the right or left leg in front.

Although patients in the slacklining group did not demonstrate significant changes compared with baseline for postural stability, they did demonstrate significant improvements related to freezing of gait and fear of falling.

The slackline therapy was also associated with low levels of self-reported tiredness or fatigue.[12]

A 2016 study authored by Lars Donath, PhD, a professor in the Department of Sport, Exercise, and Health at the University of Basel in Switzerland, investigated 28 healthy older adults (aged 60 years and older), half of whom were assigned to an intervention group and completed six weeks of slackline training.[13] Among the 11 participants whose slackline performance improved, functional magnetic resonance imaging findings suggested increased efficiency of the striatal network during the training period.

The extent to which improved balance and concentration gained from slackline training transfers to other activities remains unclear.

In a meta-analysis of eight trials and 20 healthy participants of various ages,[14] Donath and his colleagues found slackline training primarily revealed meaningful task-specific training effects in balance performance tasks that were closely related to the training content, such as slackline standing time and dynamic standing balance. The analysis also noted that two of the eight studies measured transfer effects to other balance tasks and found limited evidence of transference.

"We were training slackline standing, but we didn't see other improvements in balance tasks that are more remotely related to slackline standing," Donath said. "For example, children improved on the slackline and on a wooden balance beam. But they did not improve their standing time on one leg or two legs, or in functional balance tests."

After performing the meta-analysis, Donath and his colleagues recommended that slacklining should be used as one aspect of a multimodal balance program, rather than the sole form of training.

Philip Gabel, PhD, PT, and colleagues in Australia have successfully used slacklining techniques to improve balance and function in stroke patients. (Photo courtesy of Philip Gabel, PhD, PT.)

Training testimonial

While researchers around the world are still exploring the efficacy of slacklining as a therapeutic modality, some practitioners in the US are extolling its immediate and lasting physical effects. Dan Murauski, DO, ABIHM, has read the research and applied it—personally, as well as professionally.

Murauski is medical director at Integrative Wellness Group in Chicago, a member of the Chicago Slackliners Association, and one of the organizers of the annual Breathe Slackline and Discovery Festival in Spencer, IN. He recently had an opportunity to test the benefits of his balance training after having a medial meniscus removed. Murauski believes slacklining's ability to engage a variety of muscles allowed him to recover more quickly than through traditional physical therapy methods alone.

Murauski noted another distinction: Slacking engages all three systemic components of balance: the eyes, the vestibular system,

and proprioception. However, as Murauski experienced after knee surgery, the balance system quickly atrophies if it's not engaged.

"You don't move the knee much after surgery, so you lose quad and glute strength and lose stabilizer muscles around the knee itself. Everything atrophies a bit," he said. "Slacklining helps out the hip stabilizers and muscles that cross your knee joint to help regain stability."

Prevention potential

Although the preventive effects of slacklining have yet to be scrutinized by researchers, Jim Klopman, inventor and author of a book for consumers on improving balance,[15] believes it could help mitigate injury risk in those prone to falls.

Klopman is not a medical practitioner, but he uses the principles of slackline balance training to help athletes from multiple sports disciplines —from golfers to basketball players to skiers— improve their performance. He developed a series of slackline-like devices after discovering the benefits for himself. At their Park City, UT, studio, Klopman and his wife and business partner, Janet Miller (a personal trainer) teach athletes these techniques and also work with people with various mobility issues, including multiple sclerosis.

"We see balance as a software system that is out of tune," he said. "We live in a world that's been created to accommodate the least balanced among us."

Klopman believes slackline training reboots the body's balance system by challenging it. His devices are used in a gym or clinical setting to provide the challenge found in slacklining in a safe, controlled environment. He also developed a series of foot-strengthening positions; each engaged for two minutes on the right foot and left foot, for a total of a 12-minute routine performed using his slackline-like devices.

"Often in PT we work big muscles and do a little bit of balance work, but what keeps that joint in place are the small control muscles," Klopman said. "Our balance training dramatically improves the stability of joints because we're improving the signaling to the joint and the small control muscles around the joint."

Anecdotally, Klopman reports that the benefits of slackline training can be achieved using his devices. Three years ago, 81-year-old Bud Canady began training on Klopman's foam balancing block device with the goal of improving his overall balance and stability after a series of falls. A seasoned skier, he also hoped to renew his confidence on the slopes. Canady said he believes integrating the principles of slackline balance training into his everyday movement has helped him prevent falls that could have led to injury.

"As you get older, your balance system doesn't work as well," he said. "The slackline work retrains your body to handle shocks, when you are thrown off in some way."

Clinical research has not been conclusive on the transference of benefit or the lasting effects of slacklining training, but Dakota Collins has a theory about its overarching benefits.

"Because slacklining is a mind-body practice, it helped me become more conscious of how I walk and move off the line," Collins said. "It became like twenty-four hours a day of physical therapy. Now I don't even think about it. It's intuitive to me." ler

Brigid Elsken Galloway is a freelance writer in Birmingham, AL.

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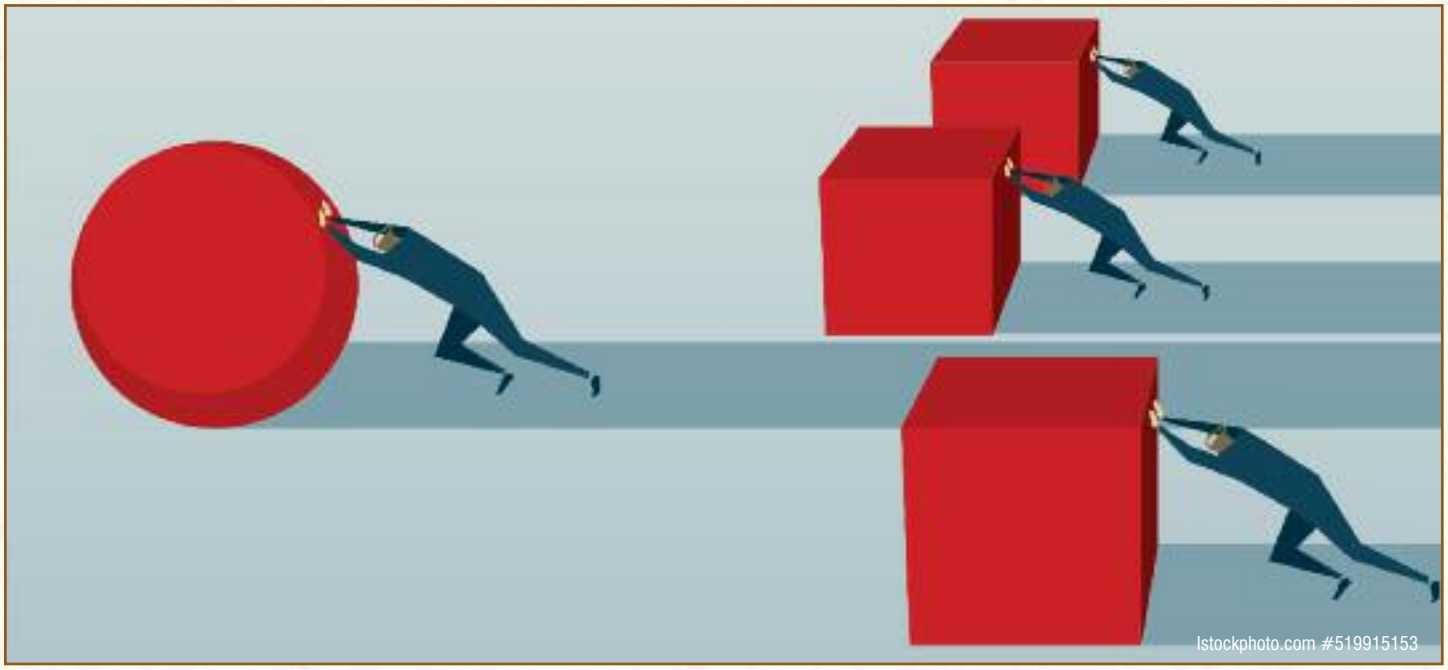
NEXT-LEVEL THINKING IN O&P:

Coverage of the 2017 ISPO World Congress

Cape Town, South Africa, isn't easy to get to from most first-world countries. But the experts who gathered there in May for the biennial International Society for Prosthetics & Orthotics World Congress aren't known for taking the easiest path to effective patient care. Research presented at this year's congress, and the related discussions among attendees that followed, illustrate the many ways specialists from around the world are reexamining traditional interventions to give O&P device users even greater mobility, functionality, and satisfaction.

By Jordana Bieze Foster



ANKLE FOOT ORTHOSES

Efforts to optimize outcomes focus on stiffness, alignment

Given the heterogeneity of many patient populations for whom ankle foot orthoses (AFOs) are indicated, it's not surprising that AFO experts are at the forefront of the current trend favoring customization of devices to meet individual patient needs. Research presented in May at the 2017 International Society of Prosthetics & Orthotics (ISPO) World Congress in Cape Town, South Africa, illustrated some of the many ways AFO stiffness and alignment can be optimized in the interest of patient-centric care.

In two ISPO presentations, investigators from the Netherlands discussed preliminary findings from an ongoing trial designed to assess the effects of optimizing AFO stiffness in patients with calf muscle weakness; the trial protocol was epublished in February by the online journal *BMJ Open*.

Participants wore experimental AFOs with a custom footplate and a replaceable dorsal leaf-spring, the stiffness of which could be varied. Five stiffness levels, ranging from 2.5 Nm/° (K1) to 6.2 Nm/° (K5), were assessed. The researchers analyzed the patients' walking gait mechanics and energy cost in shoes only and with the five AFO configurations, tested in random order.

Data for the first 25 patients were presented in Cape Town. All AFO stiffness conditions were associated with faster walking speed than shoes only, but there was no effect of stiffness on gait speed, which remained well below published norms for healthy individuals. Similarly, all of the AFO conditions were associated with lower energy cost than shoes only, but again there was no effect of stiffness.

However, varying AFO stiffness did have significant effects on ankle angle and pushoff power. Ankle angle for all AFO conditions was significantly smaller than for shoes only, and decreased significantly further with increasing stiffness. Pushoff power also decreased with stiffness and was significantly greater than with shoes only for all but the stiffest AFO condition.

"We would advise that patients are provided with the lowest appropriate stiffness level to preserve pushoff power," said Niels

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More ISPO coverage:

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Waterval, MSc, a doctoral candidate at Academic Medical Center Amsterdam, who presented the findings in Cape Town.

Although there were no significant effects of stiffness on energy cost and gait speed for the group overall, the authors noted that considerable variability existed from one study participant to the next.

Merel-Anne Brehm, PhD, a senior research associate at Academic Medical Center Amsterdam and Vrije University Amsterdam, presented data for two different patients to illustrate this variability and how it will affect device optimization.

The first example was a man, aged 66 years, with hereditary motor sensory neuropathy affecting both lower limbs. In this patient, the stiffest AFO (K5) was associated with the greatest decrease in energy cost, but the least-stiff AFO was associated with the second-greatest decrease. The stiffest AFO was also associated with the greatest improvement in gait speed, dorsiflexion angle, and pushoff power; thus, it was the logical choice as the most optimal device for that patient.

The second example was a woman aged 52 years with myotonic dystrophy affecting both lower limbs. For her, the effects of stiffness on ankle angle and pushoff power were similar to those seen in the first example. However, for this woman, the least-stiff AFOs (K1 and K2) were associated with the greatest improvement in gait speed; the decrease in energy cost for her was greatest for the stiffest AFO (K5), followed by the second-most-flexible AFO (K2). The researchers determined the K2 stiffness level was most optimal for this patient.

In the next phase of the study, which aims to include 37 patients, each participant will spend 12 weeks wearing AFOs with the stiffness level that was selected as optimal for him or her based on the initial gait analysis. Gait will then be reassessed after the 12 weeks to determine any effects of the intervention.

Ultimately, Brehm said, the researchers hope their work will enable clinicians to optimize patients' AFO stiffness without having to actually test multiple different stiffness configurations themselves.

"I think that there are still several steps to take before we can apply this to clinical practice," Brehm said. "We want to develop a model to determine the optimal stiffness for each patient."

3D printing

Additive manufacturing, a method of 3D printing (3DP), could help in the quest for individually optimized AFOs, as it can be used to incorporate multiple materials of different densities and stiffnesses into a single device component (see "Pluses and minuses of additive and subtractive approaches," July 2014, page 27).

One of the challenges of applying 3DP to orthotic device manufacturing, however, is that 3D printers often aren't compatible with the types of materials that historically have been used for orthotic devices, and few studies so far have compared the properties of 3DP-friendly materials and conventional materials. But research from Thomas More University College in Geel, Belgium, is beginning to address the latter issue.

Investigators designed AFOs for a single healthy man, with one type of device made from polypropylene using conventional methods and the other type made from 3DP-compatible nylon (PA-12) using additive manufacturing. The stiffness of the two materials was similar.

Both devices then underwent five million cycles of dorsiflexion and plantar flexion during bench testing in which the AFO was fitted to a prosthetic limb; the devices' stiffness was tested every 500,000 cycles. No substantial changes in stiffness or durability were observed for either device, according to Kris Cuppens, PhD, a researcher in the university's Mobilab, who presented the findings in Cape Town.

AFO tuning

Of course, stiffness is only one of many variables that can be targeted when optimizing AFOs for individual patients. Several ISPO presentations discussed the increasingly popular concept of "tuning" an AFO—particularly solid AFOs used commonly in children with cerebral palsy and in poststroke adults—to be optimally aligned in combination with a patient's footwear (see "Quantifying effects of AFO alignment," July 2010, page 27).

Researchers from Thailand and the UK analyzed the effects on standing balance of AFO-footwear tuning in seven children with spastic diplegic cerebral palsy and gastrocnemius contracture who demonstrated at least five degrees of plantar flexion.

Standing balance was assessed while the children were barefoot, wearing solid AFOs aligned with the ankle in 90° of dorsiflexion, and in the same type of AFOs that had been tuned for each patient. For each AFO condition, the children were instructed to wear the devices at least six hours per day for two weeks between fitting and testing.

Postural sway associated with the tuned AFOs was significantly lower than for the other two conditions, suggesting that AFO tuning has benefits for standing balance as well as gait, according to Pornsuree Onmanee, PhD, CPO, a researcher with Sirindhorn National Medical Rehabilitation Center in Nonthaburi, Thailand, who presented the findings in Cape Town.

But clinical improvements associated with AFO tuning aren't always consistent with patient preferences (see "AFO tuning: Balancing function and satisfaction," August 2014, page 27), as illustrated by a pilot study from the Philippines.

Investigators analyzed balance, mobility, and self-efficacy in 14 patients who were at least six months poststroke; seven wore tuned rigid AFOs and seven wore untuned rigid AFOs. Scores on the Berg Balance Scale and Timed Up and Go test were significantly better with AFOs than with shoes only in the tuned group but not in the untuned group. However, scores on the Activity-specific Balance Confidence scale were significantly better with AFOs than with shoes only for the untuned group, but not the tuned group.

The findings suggest strategies may be needed to help patients feel more comfortable in tuned devices, given the potential for functional improvement, according to Jemiah Faye Guillermo, CPO, a researcher at the University of the East in Manila, who presented her group's findings in Cape Town.

"If I were to choose, I would still prefer tuning, as it can be associated with other benefits," Guillermo said. (ler)

Sources:

Waterval NF, Nollet F, Harlaar J, Brehm MA. Precision orthotics: optimizing ankle foot orthoses to improve gait in patients with neuromuscular diseases: protocol of the PROOF-AFO study, a prospective intervention study. BMJ Open 2017;7(2): e013342

Waterval N, Nollet F, Harlaar J, Brehm MA. Effect of varying ankle foot orthosis stiffness on gait biomechanical and walking energy cost in patients with neuromuscular disorders exhibiting calf muscle weakness. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Brehm MA. Precision orthotics to improve the effectiveness of orthopedic assistive devices: ankle foot orthoses. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Cuppens K, Saey T, de Raeve E, et al. A protocol to test durability of traditional and additive manufactured AFOs: preliminary results. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Onmanee P, Bower R, Ross K, et al. Effect of tuned solid ankle-foot orthoses on standing balance in cerebral palsy children with spastic diplegia and contracture of the gastrocnemius muscle. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Guillermo JF. Effects of tuned and untuned posterior shell rigid ankle foot orthosis on balance, mobility and self-efficacy in adult patients with hemiplegic stroke: a pilot study. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

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NONMECHANICAL EFFECTS

Sleeves showcase softer side of knee pain management

Less may be more when it comes to knee bracing in some patients with knee osteoarthritis (OA) and patellofemoral pain (PFP), according to studies of soft knee braces presented in May at the 2017 ISPO World Congress in Cape Town, South Africa.

Research from the University of Central Lancashire in the UK analyzed the biomechanical effects of a soft brace in four patients with mild knee OA and 10 controls during a step-down task.

At the knee, use of the soft brace was associated with significant decreases in transverse plane range of motion and transverse plane angular velocity (a measure of the rate of collapse into internal rotation, which reflects patient stability). Interestingly, the soft brace was also associated with a decrease in ankle angular velocity during pronation in the patients with knee OA, along with a decrease in hip internal rotation velocity in the controls.

"Since the brace is not acting mechanically, the only way this is possible is if the brace is affecting neuromuscular control," said James Richards, PhD, a professor of biomechanics at the University of Central Lancashire in Preston, UK, who presented the findings in Cape Town.

In the knee OA patients, four weeks of soft brace use was also associated with significant improvement in self-reported pain and function assessed using the Knee Osteoarthritis Outcome Score (KOOS).

Richards noted that one patient, an avid golfer, went from needing a motorized golf cart to walking all 18 holes with the use of the soft brace. He cautioned, however, that response to the soft brace varied within the study population, and that categorizing patients into subgroups could help predict response to soft bracing and other knee OA interventions.

Richards and colleagues have been at the forefront of efforts to define subgroups of this type within the PFP population (see "Patellofemoral pain subgroups: A critical first step toward personalized clinical intervention," January 2017, page 18). And a second ISPO presentation by Richards focused on just one of those PFP subgroups: the "strong" group, which includes most athletes, characterized by patellar hypomobility without hip abductor or quadriceps weakness.

In 20 individuals with PFP who wore a soft knee brace for two weeks, the investigators found significant reductions compared with baseline for peak patellofemoral forces, patellofemoral pressure, patellofemoral loading rate, and peak knee abduction moment during running and cutting. The soft brace was also associated with improvement in KOOS scores for the pain, sport, function, and quality of life subscales.

"Even soft knee bracing can reduce pain and symptoms by reducing patellofemoral joint forces. We're moderating a change in force with something made of cloth," Richards said. "This is possible through incremental increases in proprioception and neuromuscular control. Sensory input can affect movement strategy."

Two other Cape Town presentations examined the extent to which the amount of pressure applied by a soft brace influences its effectiveness.

In 20 healthy individuals, researchers from Jönköping University in Sweden found that although a rigid brace applied more pressure at the knee than a soft brace, the latter was associated with better detection of passive motion.

"High amounts of pressure may in fact compromise proprioception," said Nerrolyn Ramstrand, PhD, BP&O, an associate professor of prosthetics and orthotics at the university, who presented her group's findings in Cape Town. "That's something we haven't thought about."

However, in 44 patients with self-reported knee OA, researchers from VU University Medical Center Amsterdam in the Netherlands, found minimal differences between a properly fitted soft brace and one that was one size too large. Compared with no brace, both soft braces were associated with significant improvement in activity limitations, pain, and self-reported knee stability and knee confidence during level and perturbed treadmill walking.

Sources:

Richards J, Chohan A, Kwaees T, Rawlinson G. Exploring the effects of a non-mechanical knee brace on knee kinematics & kinetics during step descent in healthy individuals & the implications for patients with knee osteoarthritis. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Richards J, Sinclair JK, Selfe J, et al. The effect of knee bracing on pain, symptoms and patellofemoral loading in recreational athletes with patellofemoral pain. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Ramstrand N, Starholm I, Gjøvaag T, Rusaw D. Effects of knee orthosis design on proprioception and balance. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Cudejko T, van der Esch M, van der Leeden M, et al. The immediate effect of a soft brace on pain, activity limitations, self-reported knee instability, and self-reported knee confidence in patients with knee osteoarthritis. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

DIABETIC FOOTWEAR

Scientific approach to insole design helps reduce pressure

A scientific approach to insole design can help reduce plantar pressures associated with diabetic footwear, in turn reducing the risk of plantar ulcerations, according to research presented in May at the 2017 ISPO World Congress in Cape Town, South Africa.

In 24 patients with diabetes at high risk for ulceration, investigators from Vrije University Amsterdam in the Netherlands compared fully custom footwear with three noncustom extra-depth footwear conditions that differed with regard to insole design: insoles evaluated and modified based on in-shoe plantar pressure; insoles designed based on barefoot pressure and foot shape, and modified based on in-shoe pressure; and insoles designed and manufactured using computer-assisted techniques based on barefoot pressure and foot shape.

Not surprisingly, pressures under the metatarsal heads were lowest for the custom footwear. But those pressures were lower than 200 kPa (an oft-used threshold for ulceration) in more than 90% of cases with insoles based fully on in-shoe plantar pressure, and in more than 75% of cases with insoles designed based on barefoot pressure and foot shape data and modified based on in-shoe pressure.

"Compared with the more traditional approach to diabetic footwear, we're moving toward a more scientific approach," said Sicco Bus, PhD, senior investigator and head of the university's Human Performance Laboratory, who presented the findings in Cape Town.

Sources:

Bus S. Precision orthotics to improve the effectiveness of orthopedic assistive devices: therapeutic footwear. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

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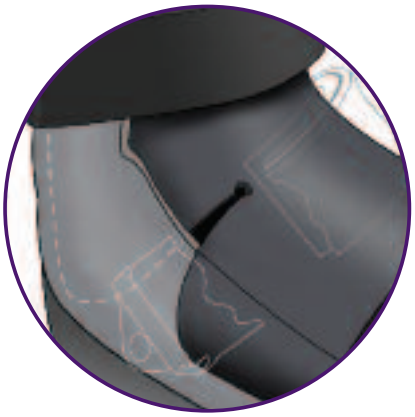

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OSTEOARTHRITIS

Studies explore mechanisms for distal knee OA therapies

Studies presented in May at the 2017 ISPO World Congress in Cape Town, South Africa, added to knee experts' understanding of the mechanisms underlying distal interventions to reduce pain and joint loading in patients with medial knee osteoarthritis (OA).

As patient compliance with traditional offloading knee braces remains largely suboptimal, clinicians who treat patients with medial knee OA are exploring the potential benefits of devices worn distal to the knee joint, which are less prone to migration and may be more discreet. These include a shoe with a series of grooves on the sole at major flexion points to mimic barefoot-like foot movement and an ankle foot orthosis (AFO) that shifts the center of pressure of the ground reaction force laterally.

Although the OA shoe has been associated with reductions in knee loading when averaged across study populations, research from the University of Central Lancashire in Preston, UK, suggests not all individuals respond positively to the intervention and that hip rotation strength and range of motion may help predict patient response.

Investigators assessed knee adduction moment (KAM) in 32 healthy volunteers as they walked under two conditions, wearing the OA shoes or standardized control shoes. The OA shoe was associated with a lower KAM than the control shoe, as expected, in most of the 64 knees; however, in 19 knees the KAM either increased or did not change in a clinically meaningful way.

The researchers found significant differences in hip internal/external rotation and internal/external rotation strength between the responders and nonresponders, which suggests that hip-specific factors may be predictive of response, according to James Richards, PhD, a professor of biomechanics at the university, who presented the findings in Cape Town.

"This is a footwear intervention, but hip variables appear to determine responders versus nonresponders," Richards said. "Now we need to see if the same is true in patients with knee OA."

In a second ISPO presentation, researchers from Duderstadt, Germany-based Ottobock reported that an AFO designed for patients with knee OA compared favorably to a conventional offloading knee OA brace.

Investigators analyzed level walking gait in 28 patients with moderately severe knee OA (Kellgren-Lawrence grade 2-3); 16 wore knee braces and 12 wore AFOs. Reductions in pain were associated with both devices, but only in the AFO group was KAM with the device significantly lower than without. AFO use was also associated with a decrease in KAM in a 10-person control group.

In the AFO users, the tibia was more externally rotated with the device than without, and the center of pressure (COP) shifted laterally. This finding may help explain the mechanism involved, according to Thomas Schmalz, PhD, a biomechanist with Ottobock who presented the results in Cape Town.

"Since the AFO has no direct effect on the knee, it must be the COP shift that leads to the offloading," Schmalz said. ler

Sources:

Richards J, Kim Y, Chohan A, et al. Can treatment response to a shoe designed for knee osteoarthritis be predicted from biomechanical and clinical measurements? Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Shakoor N, Lidtke RH, Wimmer MA, et al. Improvement in knee loading after use of specialized footwear for knee osteoarthritis: results of a six-month pilot investigation. Arthritis Rheum 2013;65(5):1282-1289.

Schmalz T. Orthoses within the treatment of osteoarthritis of the knee: biomechanical comparison of KO and AFO principles regarding function and effect. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Menger B, Kannenberg A, Petersen W, et al. Effects of a novel foot-ankle orthosis in the nonoperative treatment of unicompartmental knee osteoarthritis. Arch Orthop Trauma Surg 2016;136(9):1281-1287

INSOLE MODELING

Computer analysis facilitates foot orthosis development

Computer modeling is facilitating advances in insole development for patients with diabetic neuropathy and rheumatoid arthritis, according to data presented in May at the 2017 ISPO World Congress in Cape Town, South Africa.

Researchers from the UK have pioneered the use of finite element analysis (FEA) in creating models of the foot on which to base plantar pressure-based insole design, in 2016 publishing a simplified version of the process to make it more clinically useful.

More recently, in 18 patients with diabetic neuropathy, the investigators compared the effects on plantar pressure of insoles made using three different techniques: the standard method involving a foam box and CNC (computerized numerical control) manufacturing, a method involving FEA-based design and CNC manufacturing, and a third method involving FEA and 3D printing.

Before the intervention, all patients had significantly elevated plantar pressures under the metatarsal heads but no active foot ulcers. When the insoles were worn, the devices created using the two FEA-based methods were associated with significantly greater reductions in those plantar pressures than the conventional method.

"We feel we've made some promising insights with regard to moving this forward," said James Woodburn, PhD, interim director of the Institute for Applied Health at Glasgow Caledonian University, who presented the preliminary findings in Cape Town.

Researchers from Aalborg University in Denmark are using a different type of modeling—using patient-specific bone geometry based on magnetic resonance imaging—to determine the effect of patient-specific insoles on ankle mechanics in patients with early stage rheumatoid arthritis.

In four women, the investigators found that the optimized insoles were associated with lower ankle plantar flexion moments during stance phase and toe-off, as well as less soleus muscle force—all of which could help decrease pain—compared with a control insole from a running shoe. ler

Sources:

Woodburn J. Precision orthotics to improve the effectiveness of orthopedic assistive devices: foot orthoses. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

Telfer S, Erdemir A, Woodburn J, Cavanagh PR. Simplified versus geometrically accurate models of forefoot anatomy to predict plantar pressures: a finite element study. J Biomech 2016;49(2):289-294.

Simonsen MB, Naesborg-Andersen K, Kowalski MR, et al. Patient-specific musculoskeletal modelling of foot orthotics effect on rheumatoid arthritis patients ankle joint loading. Presented at the International Society of Prosthetics & Orthotics World Congress, Cape Town, South Africa, May 2017.

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Study challenging Root concepts reignites debate

The latest paper to challenge biomechanics-based foot orthotic management concepts developed decades ago has revitalized a long-running discussion among foot specialists about how to define normal structure and function and which assessments should be used in prescribing foot orthoses.

By Cary Groner

A recent paper in the *Journal of Foot and Ankle Research (JFAR)* added fuel to a long-burning controversy over how to assess what's normal and abnormal in the structure and function of the foot, and how—if at all—those assessments should be used to guide orthotic management.[1]

Researchers at the University of Salford in the UK evaluated the left foot of 100 asymptomatic individuals using the static biomechanical approach promulgated in the 1970s by Merton Root, DPM,[2] then compared those findings with foot motion during gait. They found that none of the "deformities" (abnormal alignment or range of motion) suggested by the Root method correlated with altered foot kinematics, which poses an obvious conundrum for clinicians who base treatment on an assessment using a subtalar joint neutral foot position.

Other experts have reached similar conclusions. For example, Australian researchers reported in 2015 that clinical measures of foot posture explained only a small amount of the variation observed in foot kinematics.[3]

Andrew Buldt, PhD, a postdoctoral researcher in foot biomechanics at La Trobe University in Melbourne and that paper's first author, told *LER* "there was a small relationship, but not enough to make clinical decisions."

The researchers behind the new paper went further, however, proposing that the Root assessment model was no longer valid for clinical practice, that clinicians should stop using subtalar neutral and other nonweightbearing alignments and movements to define foot "deformities," and that the method was likely irrelevant for prescribing foot orthoses.

"We measured foot kinematics in what we think is the most accurate way possible," said lead author Hannah Jarvis, PhD, a postdoctoral researcher at Manchester Metropolitan University in the UK and a fellow at Salford, where she wrote a dissertation that laid the groundwork for the *JFAR* article. "We attached marker plates to the foot, and were able to capture individual bone movement and

The University of Salford findings pose a conundrum for clinicians who base orthotic treatment on assessments that involve a subtalar joint neutral foot position.

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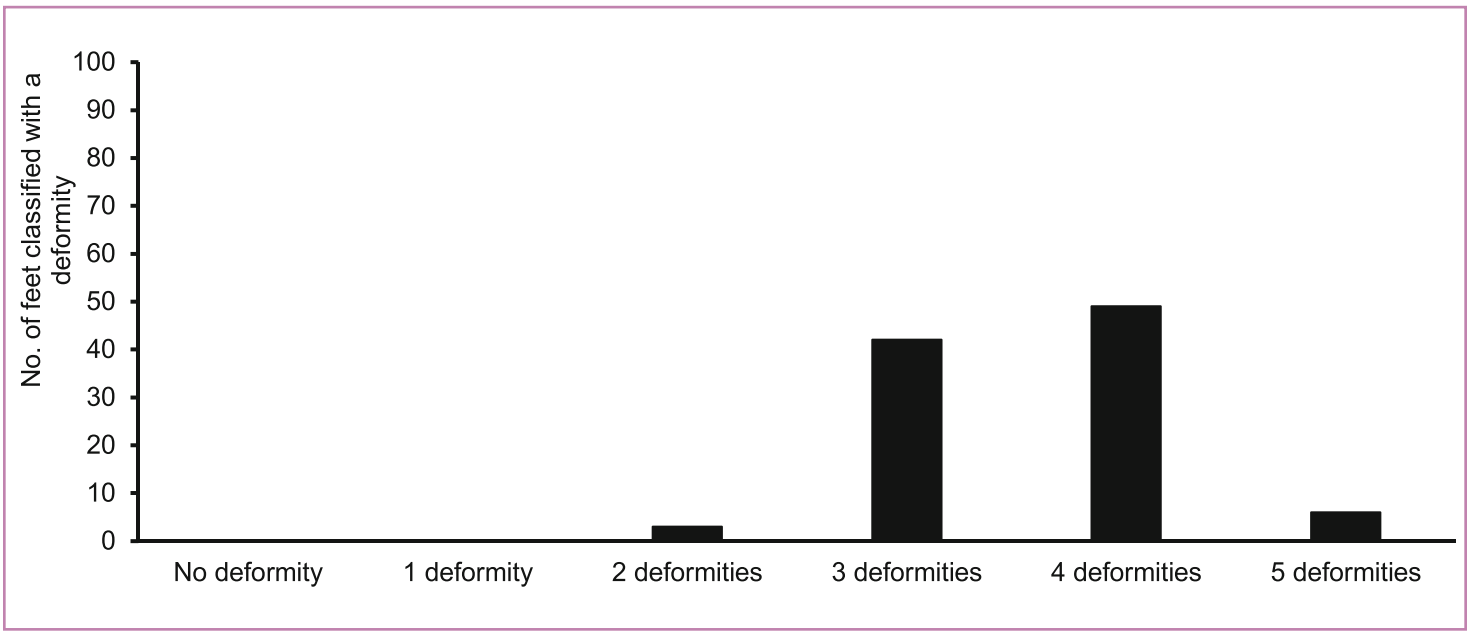

Figure 1. Jarvis et al analyzed the feet of 100 symptom-free participants and found that all were associated with at least two deformities according to a Root-based assessment. (Reprinted with permission from reference 1.)

compare that to the Root static assessments. Root suggested that the subtalar joint was the key joint in the foot, but our results indicate that all the joints are equally important in their contribution to foot movement."

Blowback

Responses to the article came from some august quarters, and they were not universally supportive. Tom McPoil, PT, PhD, a professor in the School of Physical Therapy at Regis University in Denver—and one of the original critics of the Root approach—said he pointed out in his peer review that a study using 100 healthy left feet, regardless of quality, was unlikely to provide compelling evidence of issues with the Root model.

Moreover, in response to the paper's assertion that its results "question the relevance of the Root assessments in the prescription of foot orthoses," he noted that because the authors didn't assess the effect of orthoses on foot kinematics, the statement was purely speculative.

McPoil also offered supportive comments, however, calling the manuscript an important addition to the evidence accumulated over the previous 20 years regarding controversies associated with the Root approach.

Some of the evidence McPoil referred to was his own. As early as 1994, he was the first author of a study that reported a disconnect between rearfoot angle in a subtalar neutral position and the actual pattern of rearfoot motion during walking.[4]

The next year he was the first author of a paper that acknowledged Root's contribution to redefining the clinical view of the foot from a static to a dynamic structure, but that also pointed out some of the approach's conceptual and practical limitations.[5] For example, the paper noted that Root's findings were difficult to reproduce, and that use of the subtalar neutral position to define a "normal" foot created a classification system in which almost everyone's feet were to some degree abnormal. Moreover, McPoil and his colleagues pointed out that Root's description of subtalar neutral was based on one first proposed in 1964 by Wright et al,[6] but noted that Wright used the term very differently—and in a way that not only agreed closely with McPoil's findings but also varied significantly from Root's.

Perhaps most pertinent to the Jarvis paper, in that prescient 1995 article McPoil wrote: "Investigations[7,8] … have demonstrated the inability to predict dynamic motion of the rearfoot during walking when using the static foot evaluation procedures as described by Root et al."[5] The 1995 paper went on to propose a "tissue stress model" as a basis for diagnosing and treating foot disorders, which has had a powerful influence on clinical thinking ever since.

The Root of the matter

Contemporaries of McPoil had suggested the basics of the tissue stress model even earlier. Kevin Kirby, DPM, an adjunct associate professor at the California School of Podiatric Medicine at Samuel Merritt College in Oakland, who also maintains a private practice in Sacramento, published his first objections to the Root model in 1990, including a pointed screed titled, "Inaccuracies in podiatric biomechanics dogma."[9]

This detailed examination of the Root approach stated nine specific problems—for example, "Inaccuracy #1: The calcaneus must be in the vertical position while in relaxed calcaneal stance position in order for the foot to function normally during gait"—each of which was followed by a terse rebuttal. It was a bit reminiscent of Martin Luther nailing his 95 theses to the church door, and it was received, at first, with similar consternation. It's important to bear in mind, however, that Kirby was a student of Root's, knew him personally, and admired his work.

"When he wrote those books—the classic is *The Normal and Abnormal Function of the Foot, volume 2*,[2]—he figured that within ten or twenty years all that information would need to be updated," Kirby said. "He was visionary, the first to start a biomechanics program in any podiatry school in the world, and he started the biomechanics fellowship I completed. His biggest problem was that,

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instead of saying his model of the foot was a structural ideal, he said it was normal, which has a very different connotation. He also said that there can be many variations from normal with which the foot will still function well, but too much deviation can cause problems."

In the original text,[2] Root wrote, "As noted by the definitions, these neutral positions are purely reference points. They are significant, however, in that they make it possible to measure and define positional and structural variances."

This doesn't sound much like pulpit-pounding dogma, which reinforces Kirby's point about Root's intentions—even if Kirby was the one to call the results of Root's proposals "dogma" in the first place.

And Root, to his credit, seemed to anticipate the tissue stress model when he wrote, " … it becomes obvious that the deformity has its origin in soft tissue tension whenever a triplane position of deformity is observed within the foot."[2] In the next paragraph, however, he added that when the "deformity" is uniplanar, it is caused by an abnormally shaped bone—just the sort of statement that's led to contention ever since.

Kirby believes Root would have strengthened his legacy if he'd deemphasized rearfoot position and paid more attention to the talar head and neck region.

"The position of the head and neck of the talus relative to the plantar aspect of the foot really determines the subtalar joint axis location," he said. "Mert didn't really get into that, and we now know from studies by McPoil and Jarvis that the rearfoot angle doesn't strongly correlate with function or pathology."

Such considerations don't remain in the lofty realm of academic publications, of course, and Kirby explained how they can affect clinical practice.

"I became aware of the problem early on," he said. "You'd have someone come in with differently shaped feet—a flatter foot on one side which was associated with symptoms—say, posterior tibial tendinitis. The other side, which did not have as flat a foot, didn't have those symptoms. So, you'd go through the Root measurements and the heels [inversion/eversion] would come out within a degree or two of each other, which is within reasonable measurement error; that meant the measurements weren't giving you any idea why that person was developing tendinitis on one side. They didn't take into account the position of the talar head and neck, and didn't correlate with gait function—with either the kinematics or the pathology I was seeing. When that happens, you'd better develop a better theory."

Filial duties

Jeff Root, Merton's son, has found himself in the odd position of defending his father's legacy while acknowledging that its foundations may require some adjusting given the eroding tides of new data. Although he is not a podiatrist, Jeff Root now owns the Root Laboratory, an orthotic fabrication company in Meadow Vista, CA, and keeps abreast of the issues for obvious reasons.

"When Root was a student, they really didn't know what caused foot pathologies, which made them very difficult to treat," he said. "He came up with the concept of subtalar neutral position—where the foot is neither supinated nor pronated—because we needed to establish a convention whereby we could communicate about location and structure. But the foot only passes through subtalar neutral, as it does through many other points, and he was very clear about that; he wanted to promote healthy motion that was not pathological."

Jeff Root also pointed out that podiatry is about more than prescribing orthoses.

"When podiatrists consider surgeries like an Achilles tendon lengthening, they need to assess the range of ankle dorsiflexion and determine whether the surgery is warranted," he explained.

Clinicians benefit from a common terminology about the structure of the foot in such situations, in other words, even if those terms don't necessarily relate to kinematics.

"My problem with the Jarvis paper is that they're telling us what we shouldn't do, not what we should do," he added.

And, though Jeff Root sees the potential for tissue stress theory to change the field, he wrestles with aspects of it.

"We need a model that's teachable, that's reproducible," he said. "Tissue stress theory is great, but in my opinion, it's not yet a consistent model. If the goal is to make this a more scientific process, how do you make it more clinically practical? I think that's where we're struggling."

Tissue stress

Kevin Kirby agreed, to a point.

"One problem is that a lot of studies attempt to classify how the foot works, but they don't really classify pathologies," he said. "They're conducted in people without symptoms, and we don't treat people without symptoms. Hannah Jarvis looked at kinematics, but it's kinetics—the forces and moments acting on the foot—that cause injuries. Structural deformities might not affect kinematics but could cause changes in kinetics."

As it happens, however, Jarvis and colleagues *did* collect kinetic data—they just haven't been published yet.

"We're putting together a series of papers following from those data," she told *LER*. "We have force-plate data on ground reaction forces to calculate moments. We also have EMG [muscle activation] and plantar pressure data of the foot and lower limb. Our project is to develop an idea about how all those factors and parameters interact with each other to cause foot movement, then hypothesize what is normal and compare that to other studies that have reported data on symptomatic feet. We're still analyzing that, and we think you can't just view the foot in one kinematic model; you have to take in lots of different factors, and be sure you're viewing the foot as a multisegmental model."

Jarvis herself is a fan of the tissue stress model, it turns out.

"I think it's the way forward," she said. "I've admired Tom McPoil's work since I was an undergrad. I think the problem is that there isn't a treatment rationale associated with it, at least on the orthotics front. With orthoses, you can reduce stresses on the tissues and relieve symptoms; the challenge lies in designing an orthosis based on measurements that relate to dynamic function."

In the 1995 article that defined the tissue stress model,[4] McPoil and coauthor Gary Hunt, PT, DPT, noted that the tissue's elastic region represents "the normal give-and-take of soft tissues which prevents excessive joint movement as the foot is loaded and unloaded." When overused, however, tissues can be deformed to the point of injury.

McPoil and Hunt proposed a four-step examination and management protocol:

(1) identifying the tissues being excessively stressed;

(2) applying controlled stresses to those tissues as well as palpation, range of motion, and muscle function/strength assessments;

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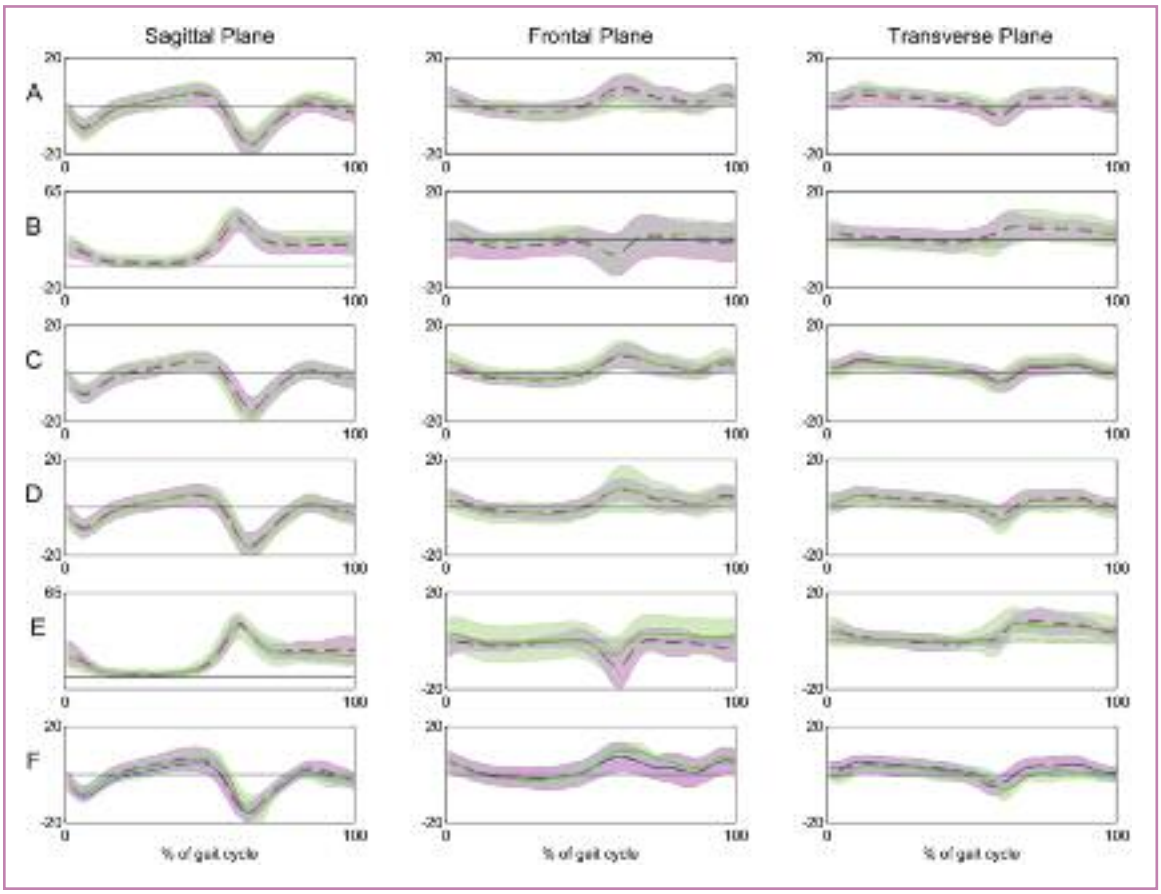

Figure 2. Jarvis et al found few differences in foot kinematics between feet classified with a deformity and those without a deformity. Graphs illustrate foot kinematics in feet with and without the rearfoot, ankle, first ray, forefoot, and hallux deformities that were investigated. Pink or blue refers to the deformity group in all cases; green = no deformity. A = rearfoot motion for ankle equinus vs no equinus deformity; B = hallux-medial forefoot motion for hallux deformity (<65° of dorsiflexion) vs no hallux deformity; C = rearfoot motion for hallux deformity (<65° of dorsiflexion) vs no hallux deformity; D = rearfoot motion for plantar flexed first ray deformity vs no first ray deformity; E = hallux-medial forefoot motion for plantar flexed first ray deformity vs no first ray deformity; F = rearfoot motion for forefoot varus/valgus deformity vs no forefoot deformity. (Reprinted with permission from reference 1.)

(3) determining whether the patient's complaint is secondary to excessive mechanical loading; and

(4) instituting a management protocol emphasizing reduced tissue stress through rest, footwear, and orthoses; healing of the tissues; and restoration of flexibility and muscle strength.

Kevin Kirby explained that tissue stresses may be due to compression loading (pressing together), tension loading (pulling apart), or shear loading (side-to-side movement), and that, ideally, an orthosis will help perform the function of the injured tissue during weightbearing activities.

"For example, the plantar fascia is a tension load-bearing structure that helps hold up the arch," he said. "If it's under too much tension, you have to make the orthotic duplicate that function. If you have posterior tibial tendinitis, you need the orthotic to help raise the arch; it creates an external force on the foot that duplicates the internal function of those structures. That reduces the load, decreases pain, speeds healing, and ideally lets the patient function better."

Orthoses

One of the problems with discussing foot orthoses—as Jarvis mentioned and as *LER* has previously reported[10]—is that even though they are often effective for relief of symptoms, no one really knows the mechanisms involved.

"You can get many patients more comfortable by using something that has basically the same shape as the foot," Kirby said. "You don't need an exact fit to improve symptoms."

As noted in that earlier *LER* article, the idea that orthoses actually correct structural alignment in the lower extremities has fallen into disfavor.[11] Tissue stress theory—that the orthosis takes some of the strain off of the foot structure it mimics—is another plausible explanation.

Moreover, Benno Nigg, DrScNat, a professor emeritus of biomechanics at the University of Calgary in Canada, has suggested the central nervous system (CNS) may be the most important actor in the play of forces under examination. Nigg has proposed that impact forces during heel strike may constitute an input signal to which muscles respond with a "tuning strategy" that minimizes soft tissue vibration.[12] This adaptation, in turn, supports a "preferred movement path";[13,14] orthoses that support that path would decrease muscle activity, but those that counteract it would increase that activity.

"Benno Nigg says that the CNS is going to control the motion of the foot regardless," Kirby said. "I don't think his theory is completely accurate, but I think it's headed in the right direction. But, again, we don't treat motion; we treat injuries caused by abnormal internal forces. So, should we quit doing all measurements? I think we need to do some—maybe not the Root measurements, but we should do the research to see if there is a correlation between ground reaction forces, foot deformities, and loading."

There is, too, an inherent tension between the work of researchers—who need conditions to be as standardized as possible to draw conclusions about asymptomatic individuals—and the work of clinicians, who increasingly are managing symptomatic patients with treatments that are as individualized as possible, regardless of what the theories say.

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> "The strength of the Root model was that it was something a clinician could understand and apply in the clinic. In that sense, it's been a good tool." — Andrew Buldt, PhD

"I see no value to subtalar neutral in terms of clinical decision-making," Gross said. "To me, it's a matter of what tissue has the pathology, why it has the pathology, and what's driving the stress. Once you understand those things, what do you do about it? If a patient is having trouble because tissue is getting stressed too much, what's driving that tensile stress?"

For Gross, it's as much art as science; sometimes there's simply no explanation for why people move the way they do.

"You can have two people with the exact same structure and static standing posture, who look similar but who move very differently," he said. "Sometimes I can explain it by things I see when they're on the table—say, soft-tissue extensibility—and sometimes I can't explain it at all. I've gotten to the point that when I see people walking, I can see if they have forefoot varus; I'm looking for that instant when the forefoot makes initial contact with the ground, and I can see it happening just on the lateral aspect of the forefoot. But when they're standing there with the foot rolled in, you don't know what's causing it."

Moving ahead

According to Andrew Buldt of La Trobe University, an emerging consensus about structure and kinematics is likely to move the field forward with increasing speed.

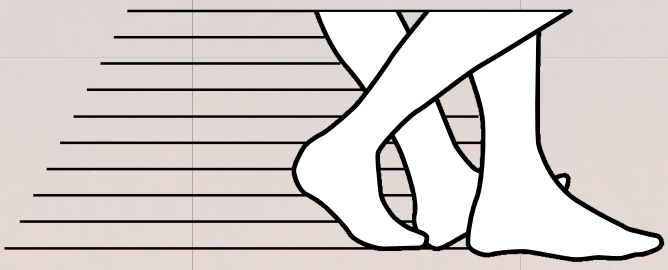
"The biomechanical techniques we're using in the lab are becoming a lot more sophisticated, and that has allowed us to challenge some of the paradigms we have used for a long time," Buldt said. "The challenge is to adapt those in a way that's usable in a clinical situation. The strength of the Root model was that it was something a clinician could understand and apply in the clinic. You didn't need a sophisticated understanding of motion analysis, and in that sense, it's been a good tool and should be acknowledged as such."

Even as research continues to suggest foot function is more complex than once thought,[3,15-17] the need to make such findings clinically relevant and useful is as vital as ever.

"The challenge for us is to use the kinematic and plantar pressure techniques we've developed to break down the foot into its constituent segments. We're getting away from viewing the foot as one functional unit that's controlled by what happens at the subtalar joint. We understand now that the foot has a number of interdependent functional units that have their own characteristics," Buldt said. "So that's our challenge: to come up with a model to understand the movements of those segments—what's normal, what's abnormal, and what leads to tissue stress and pathology." ler

Cary Groner is a freelance writer in the San Francisco Bay Area.

References are available at lermagazine.com.



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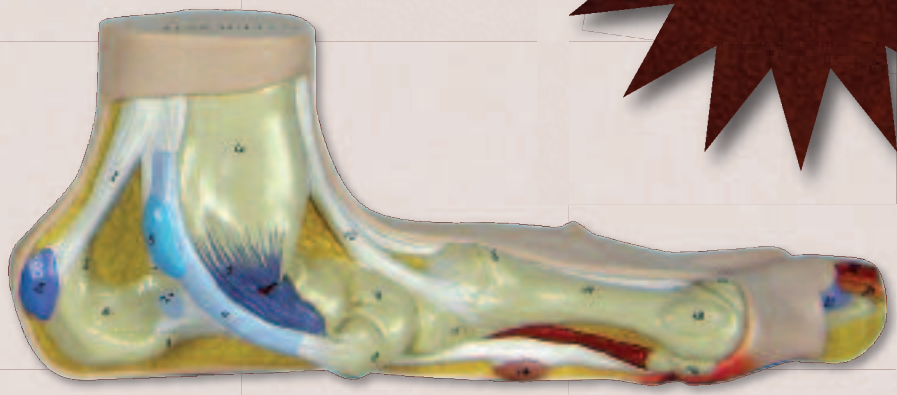

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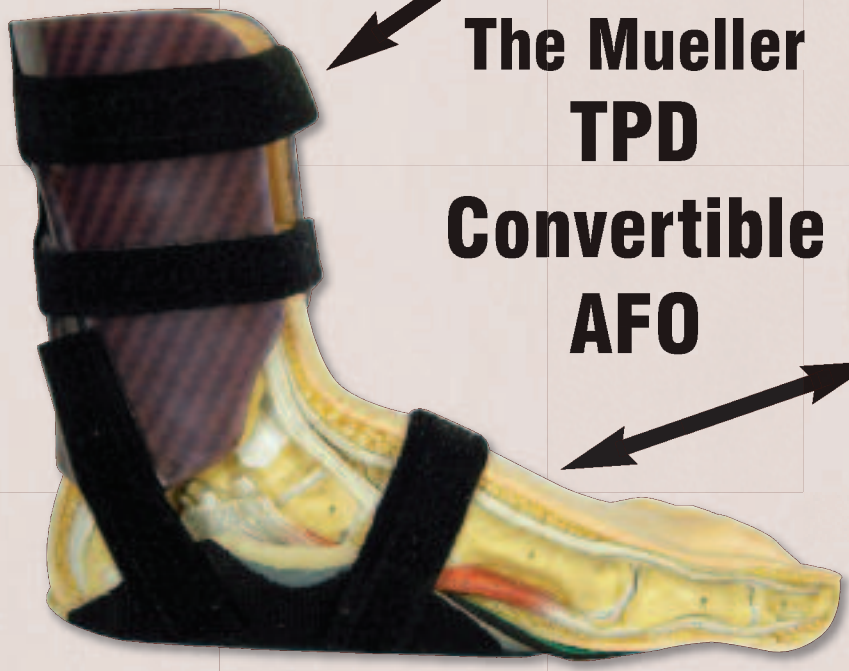

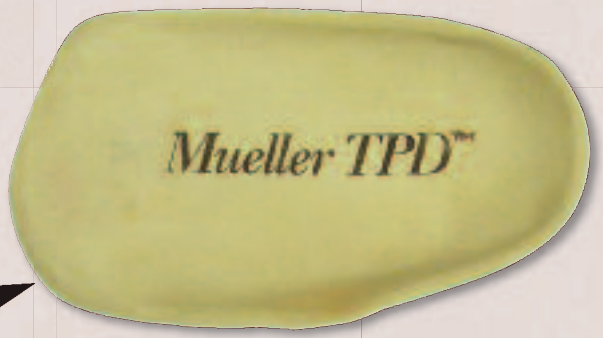

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Minimalist shoes: Risks and benefits for runners

Although there may be benefits to a change in running footwear, there are also risks associated with a switch to minimalist running shoes. Alterations in anatomy, physiology, and biomechanics associated with transitioning to minimalist footwear are likely to be unique to each runner.

By J. Todd Walker, MD; Donna Moxley Scarborough, PT, MS; Eric M. Berkson, MD; and Matthew J. Salzler, MD

Despite footwear companies engineering numerous different footwear types, many runners continue to experience injuries.[1-4] The incidence of running injuries remains high, with recent research reporting moderate to severe injuries in 74% of competitive cross-country runners.[5]

One recent attempt to help alleviate injuries in runners has been the development of minimalist footwear, designed to promote a barefoot-like running pattern. Proponents of minimalist footwear cite its more "natural" running style compared with traditional cushioned footwear. They point to reports noting the forefoot-strike pattern typical of barefoot runners is associated with lower impact forces than traditionally shod running, and that the biomechanical changes associated with switching from traditional to minimalist footwear often include adoption of a forefoot running style.[6,7] Minimalist footwear has gained popularity among runners hoping to increase endurance and performance while decreasing the risk of running-related injuries.[8,9]

Reports of injuries sustained while wearing minimalist footwear, however, have appeared in the literature.[10-14] Of note, one minimalist footwear company recently settled a class action lawsuit in which customers challenged claims of improved foot and leg strength and range of motion while using minimalist footwear.[15] Research investigating the impact forces and injuries sustained during the transition from traditional shoes to minimalist footwear soon followed.[16]

Many lower extremity clinicians are seeing these injured patients, and, anecdotally, the demand for therapy to manage running injuries associated with minimalist footwear appears to be increasing. Practitioners managing these patients will benefit from an understanding of the biomechanics associated with runners' use of—and, in particular, their transition to—minimalist footwear.

Anecdotally, the demand for therapeutic strategies to manage and prevent running-related injuries associated with minimalist footwear appears to be increasing.

Biomechanics basics

Traditionally shod runners experience different biomechanics compared with minimalist and barefoot runners.[17] Several studies have

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reported on the relationship of stride frequency and stride length to footwear conditions.[18,19] One study, which compared the running biomechanics associated with six shod/barefoot conditions in nonelite runners, found greater stride frequency and shorter stride length for minimalist or barefoot conditions than for traditional shoe wear.[19] However, there are variations in these biomechanical associations that are likely due to the position of the foot and ankle when the foot first hits the ground.[18] One of the major contributors to running biomechanics is how the foot strikes the ground.

Foot-strike pattern is typically classified as a rearfoot-, midfoot-, or forefoot-strike pattern, based on the plantar flexion and dorsiflexion angles of the foot/ankle complex at initial contact with the ground.[18] Researchers have reported that traditionally shod runners land more commonly in a rearfoot-strike style, while barefoot running is more likely to be associated with a forefoot strike.[6,18] Minimalist footwear attempts to promote this forefoot-strike pattern by offering less support and less of a material barrier between the sole of the foot and the ground, compared with traditional running shoes.[6,20]

Ground reaction forces and loading rates also have been examined in barefoot and minimalist literature, with some researchers reporting them as risk factors for foot and ankle injuries.[16,21-23] Many have reported rearfoot striking is associated with higher impact transient forces than forefoot striking.[24,25] Intuitively, it would seem that transitioning from a rearfoot-strike pattern to a forefoot pattern should be associated with a decrease in impact forces and therefore a decrease in injuries. However, research suggests that though some rearfoot strikers became forefoot strikers when transitioning to minimalist footwear, others remained rearfoot strikers;[25-27] more importantly, during the transition, many runners developed injuries, and the magnitude of impact forces in those runners, surprisingly, were inversely correlated with injury severity.[16]

Researchers continue to examine the effect of impact forces on injuries, but impact forces alone are unlikely to explain running-related injury rates. It's likely that individual anatomic variation, the ability to adapt to neuromuscular changes, and the ability of one's tissues to withstand variable loads all contribute to injury rates.

Is it safe?

One could argue that the popularity of minimalist footwear also stems from recent media coverage, including the bestselling book, *Born to Run*.[28-30] Unfortunately, there is no definitive evidence demonstrating that minimalist footwear has decreased injuries in runners. Patients are beginning to present to healthcare professionals with injuries while using minimalist footwear.

Although the incidence of injuries sustained in minimalist runners is still unknown, a 2012 study reported a range of injuries sustained while using minimalist shoe wear.[10] Salzler et al analyzed 10 patients presenting to an orthopedic surgery outpatient clinic with injuries sustained while using minimalist footwear.[10] Injuries included eight metatarsal stress fractures, one calcaneal stress fracture, and a plantar fascia rupture diagnosed with x-ray imaging and magnetic resonance imaging (MRI). All 10 patients were experienced runners, uninjured within the prior year, who decided to transition from traditional running shoes to minimalist footwear. It is important to note, however, that the time spent transitioning varied greatly among these patients and may have played a role in the development of their injuries.

Clinical implications

Collectively, it's the role of physicians, physical therapists, and athletic trainers to discuss with runners the clinical implications of transitioning from traditional to minimalist footwear. Minimalist footwear provides limited plantar cushioning for impact upon foot strike compared with traditional footwear, but offers more protection against trauma than barefoot running. Even experienced runners have sustained both soft tissue and metatarsal injuries during the transition to minimalist footwear; therefore, runners should be aware that the changes in foot-strike pattern and impact forces that occur during the transition to minimalist footwear—as well as changes that may be expected but do not actually occur—may predispose them to injury.

Further, the time required to transition safely is unknown, even though the majority of injuries sustained have been reported to occur early in the transition.[10] Runners should be counseled that there is still no conclusive evidence that minimalist footwear will reduce injuries. If an injury does occur while transitioning to minimalist footwear, a patient should expect a decrease in the distance he or she is normally able to run. If presenting to a clinician, a patient may need imaging (eg, x-ray, MRI) to aid in the diagnosis of specific injuries.

Injuries and impact forces

In one of the first studies to investigate injury rate and severity, as well as foot-strike patterns, impact forces, and associations among them, we prospectively studied 14 traditionally shod runners as they transitioned to minimalist footwear.[16] Twelve of the 14 runners sustained injuries an average of six weeks into training. Injuries to the metatarsal head and gastrocnemius and arch pain were the most common injuries. Changes in foot-strike pattern occurred during the transition as expected. Because of their injuries, runners decreased their weekly running distance by more than five miles, compared with their pretransition mileage.

Interestingly, as mentioned earlier, we found that high baseline impact transient peaks in both traditional and minimalist shoes were associated with lower injury severity scores. This suggests impact forces are not the only risk factor for injury and that our understanding of foot and ankle injuries in runners is not yet complete—it's also possible runners were more accustomed to higher impact forces. It's important to note that, despite instruction, none of the study participants followed the industry-provided guidelines for making the transition; it's useful for healthcare professionals to realize that this

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finding could reflect the habits of many runners seen clinically, and that there is an opportunity to reinforce the importance of a gradual transition to avoid injury.

Gait training programs

Recent research has shown some runners maintain a rearfoot-strike pattern during transition to minimalist footwear and in turn sustain higher loading rates.[25-27] This could explain why some runners experience injuries during the transition, especially injuries to the hindfoot, while wearing minimalist shoes. A 2016 study by Warne et al[31] assessed the combination of a gait training program advocating a forefoot-strike pattern while transitioning to minimalist footwear over six weeks. Fourteen experienced male runners received a combined intervention that included gait retraining in addition to their transition to minimalist shoes. Twelve runners completed the study and were compared with a control group who underwent gait retraining but did not use minimalist footwear.

Two participants in the combined group dropped out of the study due to injuries, seven others reported leg soreness, and three participants had to reduce their running. Only one participant in the control group decreased running distance due to muscle soreness. The loading rate was shown to be significantly lower compared with baseline in participants in the combined group, though loading rates were significantly higher in the minimalist footwear than in conventional footwear at baseline and after the intervention.

Clinically, these findings could enhance counsel to patients about options for reducing loading rates and impact forces during a transition to minimalist footwear. The number of injuries associated with the transition is important, especially in the context of reported decreased loading rates and impact forces throughout the transition period. It may be helpful to counsel patients that even with gait retraining and reduced loading rates, one might expect an injury that could decrease running distance.

An overview article of gait pattern retraining for runners described the concept of using a wearable feedback system for aiding transition from rearfoot- to forefoot-strike pattern in a successful case study of a female runner who reported reduction of knee pain within seven weeks.[32] Monitored running progression and progressive lower extremity strengthening exercises were also implemented.

The authors noted key aspects to consider in designing a successful transition to minimalist shoe wear and forefoot running program, including gradual alteration of running biomechanics, consideration of anatomical traits with known vulnerability to running injury, proper guidelines for running mileage/frequency, improving lower extremity/core strength, and neuromuscular control of movement exercises. The research to date supports the need for further exploration of all components of a comprehensive transition program.

Take time for strengthening

The intrinsic and extrinsic musculature of the foot and ankle have been associated with injuries sustained in runners and patients with chronic plantar fasciitis.[33,34] Clinically, it seems reasonable to assume that strengthening the musculature of the foot and ankle could help prevent injuries, as well as facilitate rehabilitation.

A 2016 study by Chen et al[35] studied the effects of minimalist footwear on the intrinsic and extrinsic foot muscle volume using MRI. Runners in the study completed a six-month transition to minimalist footwear program that included an exercise program described as a high-intensity program directed at the calf musculature. MRI

studies were performed at baseline and six months, and results showed a significant increase in muscle volume in the leg and forefoot. No injuries occurred during the transition, but it is unknown if any of the asymptomatic patients had findings on imaging modalities early in the transition, as the images were only taken at six-month intervals. This study suggests that a longer transition and high-intensity exercise program directed toward the gastrocsoleus complex could help reduce the risk of injuries related to minimalist footwear.

Conclusion

The incidence of foot injuries sustained while running remains high despite theoretically improved footwear. Runners and athletes will continue to try different commercially available products aimed at improving their level of function and preventing injuries; these include minimalist footwear.

Practitioners treating and advising runners should know the risks and benefits of minimalist footwear. Information provided to runners should include education about foot-strike patterns and other risk factors, and the fact that footwear alone is likely not a panacea for reducing injury risk. Although there may be benefits to a change in footwear, there are also inherent risks in the transition to minimalist running shoes. It's likely that changes in anatomy, physiology, and biomechanics during the transition will be unique to each runner, making generalized statements about the effects of transitioning difficult.

It's also difficult to make conclusions about minimalist footwear relative to barefoot running, or about variations of minimalist footwear, with regard to injury risk. Clinicians will likely see runners using traditional and minimalist footwear continuing to present to clinics in need of guidance and treatment. For runners interested in transitioning to minimalist footwear, it's important to discuss the range of potential changes in foot strike and impact forces that might result, and the clinical implications these might have. While many runners will have smooth transitions, some may have injuries early in the process that negatively affect their running mileage. These injuries might include soreness, muscle strains and tears, and stress fractures.

Risk factors associated with running continues to be a topic of debate. Specifically, the role of impact forces on injuries sustained during the transition will need additional study, as it's possible impact transient forces may not contribute to injuries to the degree that was once thought. Runners searching for ways to increase foot and ankle strength could benefit from minimalist footwear, though the risks and benefits should be discussed in detail, as even the most experienced runner could experience injuries during transition.

Currently, while the use of or transition to minimalist footwear may benefit many individuals, we recognize the risks of injury associated with such transitions and are unable to currently recommend for or against the use of minimalist footwear. ler

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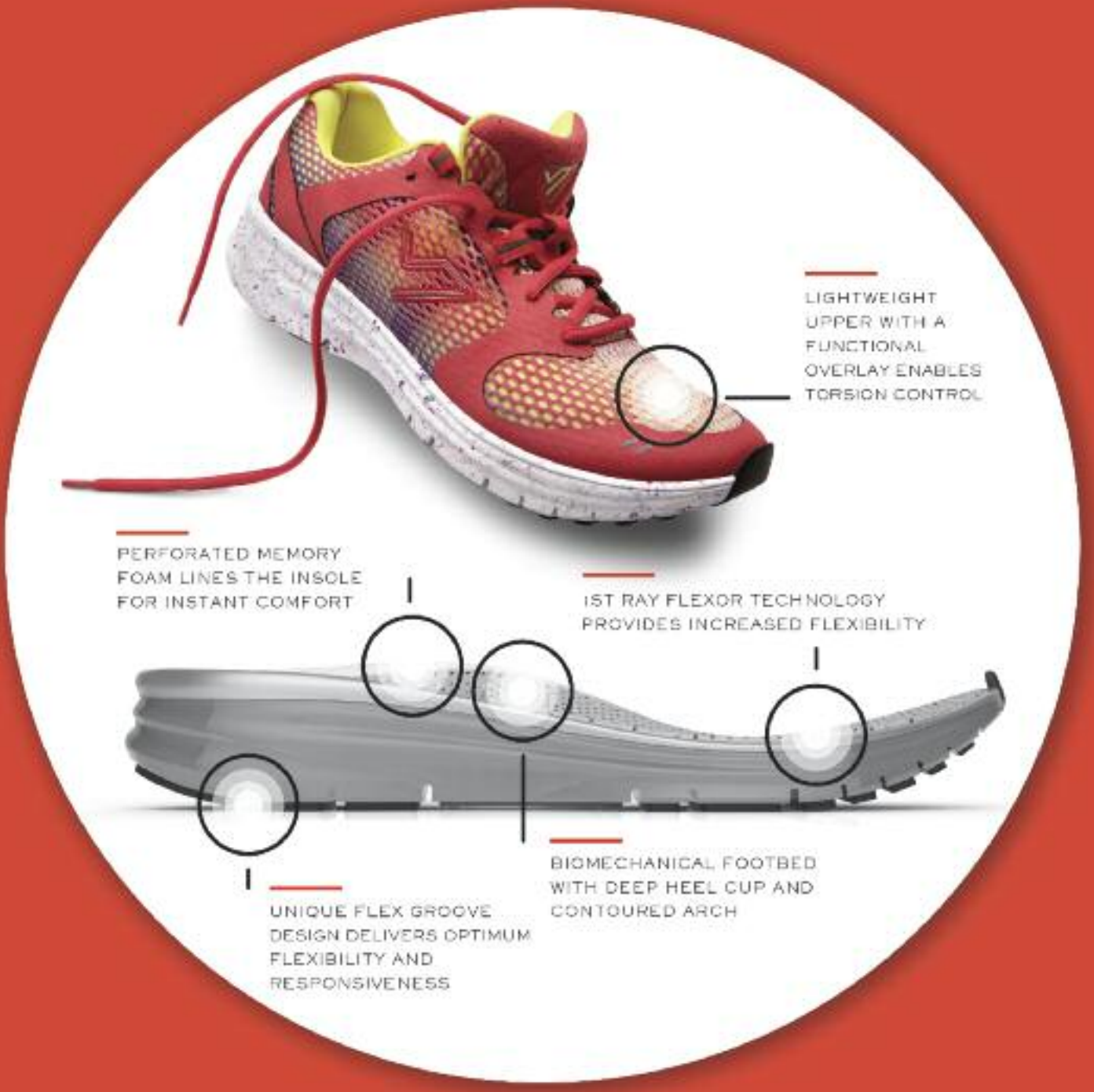

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Management of painful plantar fat pad atrophy

Aging and a number of medical conditions can lead to atrophy of the fat pads under the heel and forefoot, which often causes considerable pain. Cushioned footwear and orthoses are mainstays of treatment, but research also supports the use of fat grafting in recalcitrant cases.

By Barbara Boughton

The plantar fat pad serves as a cushion and a means of absorbing shock, but as individuals age it begins to atrophy. Like the tread of a tire, the heel fat pad can thin over time, often so much that a patient experiences heel pain that interferes with productivity and daily activities.[1,2]

"The higher the mileage we have on our feet, the more likely it is that the fat pads begin to wear out," said James Hanna, DPM, New York State Podiatric Medical Association Board of Trustees, who practices in Lockport, NY.

A normal, healthy fat pad measures 1 to 2 cm in thickness. Patients who have plantar fat pad atrophy—when the fat pad measures less than 1 cm—may be asymptomatic, but others may present with the disturbing sensation that they are almost walking on bone.[1] In patients with diabetes, heel fat pad atrophy is particularly problematic, since it may increase the risk of ulcers and associated comorbidities.[3] Pedal fat pad atrophy, which is typically associated with pain under the heads of the metatarsals, can also occur.

Risk factors

Besides age, conditions that cause atrophy of the plantar fat pad include rheumatological diseases such as rheumatoid arthritis, scleroderma, and lupus, which affect the connective tissues in the feet,[4] and conditions that result in abnormal pressures on the foot and heel, such as type 2 diabetes (especially in the presence of peripheral neuropathy or autonomic neuropathy)[5] and cavus foot. Obesity and frequent use of high-heeled shoes also increases the risk of plantar foot pad atrophy.[1]

Atrophy of the plantar fat pad is also found in runners—especially endurance runners or longtime runners with high arches—and patients who've had corticosteroid injections for foot pain, according to Alex Kor, DPM, MS, a clinician in the podiatry department of Froedtert Hospital/Medical College of Wisconsin in Milwaukee and past president of the American Academy of Podiatric Sports Medicine.

It is vital to educate patients with fat pad atrophy about the importance of wearing foot orthoses throughout the day and the best ways to choose proper footwear.

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"Even months or years later, you see foot pad atrophy in patients who've had multiple cortisone shots for heel pain," Kor said.

Some patients with heel fat pad atrophy also have conditions such as plantar fasciitis that contribute to their pain, but the painful heel symptoms in most patients come from bursitis—occurring when the bursa sac that protects the heel becomes inflamed, according to Kor. Yet, some patients are asymptomatic, and heel fat pad atrophy may be an incidental finding during diagnosis or treatment of another foot condition, he added.

Diagnosis

Although researchers have used magnetic resonance imaging (MRI) and ultrasound to diagnose and characterize heel fat pad atrophy,[3,6,7] diagnosis in clinical practice often relies on a history, physical exam, and x-rays (to rule out other conditions that can cause similar symptoms, such as stress fracture or plantar fasciitis).

"When pushing on the bottom on the feet in someone with heel fat pad atrophy, you can sometimes even feel the bones through the skin," Hanna said. "Ultrasound and MRI are also very good at diagnosing heel fat pad atrophy, but these technologies are usually

Autologous fat grafting, or lipofilling, in which fat from other anatomical sites is injected into the bottom of the foot, can help address fat pad atrophy and potentially reduce the risk of ulceration in patients with diabetes. (Images courtesy of David Armstrong, DPM, MD, PhD.)

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reserved for those cases where the findings from a clinical exam and history are equivocal."

Jeffrey Johnson, MD, president of the American Orthopaedic Foot and Ankle Society and professor of orthopaedic surgery at Washington University in Chesterfield, MO, concurred.

"For a clinical diagnosis of heel fat pad atrophy, there is usually little value in getting an ultrasound and MRI, unless you are also trying to sort out some other source of the foot pain," Johnson said.

Conservative treatment

The mainstays of treatment for heel fat pad atrophy are custom molded foot orthoses with padding, shoes that provide padding and support for the feet while walking, and heel cups or cushioned socks that help reduce the impact of walking on the foot, experts say.

"Conservative treatment can be quite successful; it can ease pain and prevent symptoms from getting worse. The idea is to replace the fat pad with shock absorption from the outside of the foot. As a result, pressure on the foot—especially on the bones and skin, where there is often damage that seriously impacts health—can be relieved," said John Steinberg, DPM, chief of podiatric surgery at Medstar Georgetown Hospital in Washington, DC. "Unfortunately, we often get pushback from patients who don't want to be burdened with wearing an orthotic that they must transfer from shoe to shoe, or to have to wear a shoe that looks orthopedic."

Thus, it is vital to educate patients about the importance of wearing foot orthoses throughout the day and the best ways to choose proper footwear that is sturdy and cushioned, Steinberg said.

Patients with heel fat pad atrophy often do well with viscoelastic orthotic devices, heel cushions, and heel cups—and any material that has at least 3 to 5 mm of cushion, Kor said. Orthoses should also have a cushioned topcover, such as those made of closed-cell polyethylene foam.

"You want a covering that is cushioned, but also does not break down over a short period of time," Kor said.

In addition to these conservative treatments, interventions that involve injecting materials into the foot have been tried—with varying degrees of success. One technique is to inject silicone into the foot, but this technique is controversial, since the silicone can migrate over time.[8,9] Complications from injecting a foreign substance in the foot are also possible, Hanna said.

Another method used by some clinicians is to inject dermal fillers into the foot, a procedure similar to those in which fillers are injected in the face to address wrinkles. These materials include products made with poly-L-lactic acid and hyaluronic acid, but they are not Food and Drug Administration-approved for use in the foot, and research into their efficacy for heel fat pad atrophy has been limited, Hanna said.

Fat grafting

One of the newest methods of treatment for foot fat pad atrophy is autologous fat grafting, or lipofilling, in which fat from other anatomical sites is injected into the bottom of the foot. Autologous fat grafting for the foot has been used since the 1990s, but early scientific studies on this technique were dogged with problems, especially necrosis of the fat. Recent research, however, has documented the effectiveness of autologous fat grafting for both pedal and heel fat pad atrophy.

In one study published in *The Foot* in 2014, a team of Italian researchers injected fat harvested from the abdomen in four patients during two sequential injections performed over 12 weeks.[10] The four patients in the study had previously undergone repair of post-traumatic soft tissue loss of the foot with skin grafts and, in one case, a cross-leg fascio-cutaneous flap. All of the patients had pain in the plantar aspect of the foot after their surgeries, had difficulty bearing weight on the heel, and showed skin instability with recurrent ulcerations and callus formation. The heel fat pad injections were aimed at thickening the tissue at the plantar sole and increasing the weightbearing capability of the foot.

All four patients demonstrated restoration of the fat pad tissue and the functional structure of the sole of the foot after the lipofilling procedure, according to lead author Giovanni Nicoletti, MD, a plastic and reconstructive surgeon in the department of clinical, surgical, diagnostic, and paediatric sciences at the University of Pavia in Italy.

During recovery, the patients were advised to avoid dynamic and static plantar weightbearing for two weeks. Then, 30% partial dynamic and static plantar weightbearing was allowed, using crutches and soft socks, for two weeks. In the final two weeks of recovery, the patients could engage in full dynamic and static plantar weightbearing, wearing custom plantar insoles, custom shoes, or both.

All four patients experienced good outcomes from the surgery with no serious complications. However, clinicians should be aware of the risk of potentially serious complications associated with these procedures, including infection and fat necrosis from failed adipose tissue engraftment,[10] Nicoletti said.

Fat grafting has also been tried as a means of preventing reulceration in high-risk diabetic feet. In a case report published in *Plastic and Reconstructive Surgery Global Open*,[11] David Armstrong, DPM, MD, PhD, and colleagues used fat augmentation to address plantar fat pad atrophy and recalcitrant preulcerative lesions in a patient aged 37 years with type 2 diabetes who had previously undergone tibialis anterior tendon transfer for a progressive chronic styloid ulcer. After four weeks in a splint, the patient successfully transitioned to normal shoe gear, and had no complications or recurrence of his wound at six weeks, Armstrong says.

"The question we asked was: Will this type of grafting hold up? It appears it will, although we don't have good long-term data yet," said Armstrong, a professor of surgery at the University of Arizona and deputy director of the Arizona Center for Accelerated Biomedical Innovation in Tucson. "By using the technique of fat grafting for heel fat pad atrophy, we give our patients with diabetes time to recover from ulcers, reduce stress on the feet, and decrease the risk of ulcers. We can heal many of our diabetic patients with ulcers by using other techniques, but the real tough nut to crack is keeping these patients healed and giving them quality of life."

As well as being a reconstructive surgery, the procedure was a means to achieve tissue repair, he said.

"Thus, we could interrupt the cycle of reulceration in the diabetic foot and keep patients with diabetes and diabetic neuropathy in remission [ulcer-free]," Armstrong said.

Pittsburgh RCT

In the first randomized clinical trial done on autologous fat grafting for pedal fat pad atrophy, researchers at the University of Pittsburgh performed one of the largest studies yet on the technique. The investigators randomized 25 patients with pain under the head of the metatarsal and diagnosed with pedal fat pad atrophy to fat grafting

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surgery or usual care.[1] The cause of fat pad atrophy among the patients included prior foot surgery, failed neuroma surgery, steroid injections, and overuse.

At six months, the patients who received injection of autologous fat, harvested from abdominal or flank subcutaneous tissue, had significantly greater improvement in pain from baseline compared with the control group as assessed by the Manchester Foot and Ankle Disability Index. At 12 months, the intervention group had statistically significant improvements in function, pain, and work/leisure activities compared with baseline, as measured with the same assessment tool.

"The only complications of the surgery were bruising and swelling, and the surgery was performed as an outpatient procedure," said Jeffrey Gusenoff, MD, one of the lead investigators for the study, and associate professor of plastic surgery at the University of Pittsburgh Medical Center. "Patients were cautioned not to engage in extended walking after surgery for four to six weeks."

The patients also wore a cushioned supportive sneaker during full weightbearing, and no barefoot walking was permitted during the recovery period of four to six weeks. Patients used towels placed on the shower floor or shower pads during the short time each day they weren't wearing protective shoes.

The University of Pittsburgh research group will continue to follow the patients in the trial. The control group in the trial that received usual care will undergo autologous fat grafting and be followed for a year, and those who initially underwent surgery will be followed for an additional year, Gusenoff said. The research group also plans to assess MRI scans taken before and after the fat pad procedures in the clinical trial to look for changes in bone and soft tissue that could explain the decreases in pain seen in the study. Another study will assess a procedure for injecting fat into the heel in patients with chronic plantar fasciitis associated with heel fat pad atrophy.

Addressing deformity

In some patients, however, heel fat pad atrophy is caused by an underlying deformity that creates a high-pressure area under the foot. These deformities include claw toe deformity, rocker bottom foot deformity, and problems in ankle alignment, Johnson said. In patients with diabetes, for instance, slowly progressive deformities associated with diabetic neuropathy—such as claw toe deformity—can increase pressure under the heel as the toes lose function, Johnson said. As a result, these patients are at risk for both fat pad atrophy and ulceration.[8]

In cases in which a heel cushion or foot orthoses are insufficient to alleviate the heel pressure, surgical correction of the deformity may be necessary, he said. These procedures have the surgical risks associated with most orthopedic procedures, including infection, blood clots, and bleeding from anticoagulant therapy after surgery. They also require a significant recovery time in a cast, splint, walking boot, or combinations of these, so should be performed only when necessary, Johnson said.

Barbara Boughton is a freelance writer based in the San Francisco Bay Area.

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Extremit-Ease Compression

Amerx Health Care has unveiled the Extremit-Ease Compression Garment for reducing lower leg edema. The Extremit-Ease combines the benefits of short- and long-stretch compression in one easy-to-use, adjustable wrap that provides 30-50 mm Hg of compression. A zipper and bungee cords with large tabs make application and adjustment of the garment simple, even for patients with dexterity issues. The lightweight, air-permeable, latex-free fabric allows for up to 12 hours of comfortable wear and reduces the risk of pistoning. Available in five circumference-based sizes and in regular and tall lengths.

Amerx Health Care
800/448-9599
amerxhc.com/extremit-ease

Hinged Thermal Vent Knee Brace

Swede-O Thermal Vent ROM Open Wrap Hinged Knee Brace combines range of motion (ROM) control, medial and lateral stability, and compressive support for mild to moderate knee instabilities. Easy to use ROM hinges help provide medial and lateral knee stability, and have flexion and extension stops (0°, 10°, 20°, 30°, 40°, 45°, 60°, 75°, and 90°). The soft thermal lining retains body heat to help relieve pain and promote healing, while the microventilated membrane allows the skin to breathe. The open knee wrap is designed for easy application and can be adjusted to accommodate edema or hard-to-fit body types.

Swede-O
800/525-9339
swedeo.com

Circulatory Insole System

Footbeat is an insole-based wearable technology featuring a small embedded engine that promotes circulation by applying precise, cyclic pressure to the arch. This system acts as a "heart," reproducing the circulatory benefits of walking even when the user is at rest, which can help revitalize muscles and ease pain. Improved circulation associated with Footbeat can also help with processing of metabolic waste and delivery of nutrients that help reduce pain and relieve discomfort. The Footbeat insole is designed to fit inside a Footbeat Moc shoe (sold separately), and is activated remotely using a Bluetooth device.

Footbeat
844/388-2839
footbeat.com

Biofreeze Professional

Inspired by the success of its Biofreeze cold therapy product for topical pain relief, Performance Health introduces Biofreeze Professional, which optimizes key ingredients in the original Biofreeze formula for a longer-lasting experience that is only available through healthcare professionals. Biofreeze Professional is easier to apply and absorbs more quickly than the original, which helps improve its ability to alleviate pain related to arthritis, sore muscles and joints, sprains, strains, and bruises. Biofreeze Professional is available in gel, roll-on, and spray applications, including larger sizes designed for use in the clinic.

Performance Health
800/246-3733
biofreeze.com

market mechanics

By Emily Delzell

Paralympian to run for U Arkansas

The University of Arkansas in Fayetteville in May reported that double-amputee Hunter Woodhall has committed to run track for the university in the 2017-2018 season.

Woodhall won a silver medal in the 200 m and a bronze in the 400 m at the 2016 Paralympic Games in Rio di Janeiro, Brazil. During his high school career (he graduated in June) in Utah, he set records in the 400 m (46.24 seconds) and the 200 m (21.17 seconds).

Woodhall, who was born with fibular hemimelia that led to bilateral below knee amputations before he was a year old, runs on carbon-fiber running prostheses. A rule interpretation made in 2015 by the National Collegiate Athletic Association Men's and Women's Track and Field/Cross Country Rules Committee allows Woodhall to compete against able-bodied runners, despite claims from the international track and field community that prostheses could confer an unfair advantage.

Committee members settled on the new reading of the rule on the use of technical devices after hearing a presentation from Alena Grabowski, PhD, assistant professor of integrative physiology at the University of Colorado, Boulder. Her research has found that prostheses-wearing athletes aren't likely to have an unfair speed advantage. ler

TCI names BOC CEO top female biz leader

The Commonwealth Institute (TCI) of South Florida in May recognized Claudia Zacharias, MBA, CAE, president and CEO of the Owing Mills, MD-based Board of Certification/Accreditation (BOC), as a top 50 women-led business leader at its 12th annual Top Women-Led Businesses Luncheon, held in Miami.

Zacharias achievements at the BOC include net growth in the number of accredited facilities and a nearly 50% increase in revenue. She's also launched a full-time business development team and revamped BOC's customer service, changes that have garnered the BOC seven Stevie Awards for business development, customer service, and innovation.

TCI South Florida, a nonprofit dedicated to advancing businesswomen in leadership positions, partnered with Miami-based CPA and advisory firm Kaufman Rossin, to survey more than 10,000 women-led businesses and develop the list, according to a BOC release.

The BOC in June announced it is seeking nominations for its board of directors.

The deadline for nominations is July 31. Go to bocusa .org/boc-board-directors for more details and a nomination form. ler

Powerstep acquires Light Orthotics

West Chester, OH-based Powerstep in April announced the acquisition of Light Orthotics, headquartered in Westlake Village, CA.

Light Orthotics produces custom orthoses in minutes by molding lightweight, light-curing composite material directly to a patient's foot.

The technology offers an advanced composite plate and provides enough resistance to duplicate the plantar surface of the foot while allowing the practitioner to hold the foot in the proper position.

Light Orthotics' devices will be merged into the ProTech range of products. ler

ACSM urges caution in peds stem cell work

The Indianapolis, IN-based American College of Sports Medicine (ACSM) in May released a call to action paper outlining major priorities for research in regenerative medicine therapies in pediatric sports injuries.

Regenerative medicine shows promise in many areas of medicine, but there is scant evidence on its safety or effectiveness for bone, cartilage, ligament, or muscle tissue injuries in children and adolescents, said study lead author Thomas Best, MD, PhD, professor of orthopedics, family medicine, biomedical engineering, and kinesiology at the University of Miami's Miller School of Medicine.

The seven-point call to action advises: exercising caution in treating youth with cell-based therapies as research continues; improving regulatory oversight of these emerging therapies; expanding governmental and private research funding; creating patient registries to gather treatment and outcomes data; developing a multiyear policy and outreach agenda to increase public awareness; building a multidisciplinary consortium to gather data and promote systematic regulation; and developing and pursuing a clear collective impact agenda to address the "hype" surrounding regenerative medicine.

Current Sports Medicine Reports published the paper on May 15. ler

Shriners—St. Louis opens MSK lab

Shriners Hospitals for Children—St. Louis in May celebrated the official opening of its research lab focusing on regenerative medicine and pediatric musculoskeletal research.

A Shriners' research team lead by Farshid Guilak, PhD, professor of orthopedic surgery at Washington University in St. Louis, in 2016 created a 3D, biodegradable synthetic scaffold made from autologous stem cells that is molded into the shape of a hip joint as a substitute for conventional implants.

Guilak and his team are also combining this SMART (stem cells modified for autonomous regenerative therapy) cell technology with gene therapy in a strategy that could prompt the body to release anti-inflammatory molecules to combat degenerative musculoskeletal diseases. ler

Brenau DPT program marks milestone

Brenau University's three-year-old physical therapy (PT) doctoral degree program in May marked important milestones with the matriculation of 40 members of the new physical therapy cohort

Their presence means the program, based at Brenau Downtown Center in Gainesville, GA, now operates at its full capacity of 120 students and will help move the young program toward full accreditation, according to a university release.

Following the positive review by the Southern Association of Colleges and Schools Commission on Colleges, the Commission on Accreditation in Physical Therapy Education (CAPTE) in late 2014 granted Brenau candidacy for accreditation, which enabled the university to admit the first cohort in May 2015.

But the program can't receive full accreditation from CAPTE until May 2018, when those first candidates complete their studies and receive degrees. ler

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Data validate uses for Zeno walkway

Research from Elon University in North Carolina presented at the American College of Sports Medicine (ACSM) annual meeting held in late May and early June in Boulder, CO, validated Havertown, PA-based Protokinetics Zeno walkway for measuring spatiotemporal parameters of backward gait in older adults and breast cancer survivors.

One presentation compared the company's Zeno walkway with one from Franklin, NJ-based GaitRite (the Zeno is wider and less portable than the GaitRite, which has been validated in previous research) in a study of backward walking in 30 older adults (age 75.1 ± 6.3 years, 19 women) who weren't at risk for falls.

Validity between the two systems showed excellent correlation on most spatial measurements and moderate agreement for some temporal parameters.

Authors concluded clinicians can use the Zeno for clinical assessment of backwards gait, keeping in mind the differences in temporal measurements if compared with published GaitRite results for healthy older adults.

Elon researchers also used the Zeno system to assess gait variability in 13 postmenopausal breast cancer survivors (mean age 58.5 ± 8.5 years) and eight healthy controls during forward, backward, and accelerated forward walking.

They found greater stance time variability during backward walking and overall greater stride length variability among the breast cancer survivors than the controls, which may indicate an increased risk of falls.

The cancer survivors also had significantly shorter step lengths compared with controls across all conditions, which could indicate a more conservative gait approach. ler

U Maryland adopts PhysiMax system

Bronx, NY-based PhysiMax and the University of Maryland Department of Athletics in College Park announced in May that the department will follow a successful pilot program of the company's movement assessment technology with a wider rollout.

The program was introduced during the 2015-2017 seasons, during which Maryland's basketball, field hockey, soccer, and volleyball teams used the PhysiMax technology. PhysiMax will also work with the university to begin a community pilot program for high school athletes, according to a joint release from the two organizations. PhysiMax's system monitors athletes' musculoskeletal performance as an online service and provides trainers with real-time athletic movement measurement and scoring. ler

OLT offers 3D-printed custom sandals

Windsor, Canada-based TDL Systems' OLT Footcare in May began a Kickstarter campaign for its 3D-printed custom sandals.

The sandals feature a full-length 3D-printed custom midsole, custom outsole, and conventional sandal uppers. OLT prints each individual sandal to match the plantar contour, length, and width of each of foot.

Practitioners can take 3D scans with the company's proprietary scanner or use foam impression boxes from the company to capture 3D details of patients' feet. The company can also incorporate a prescription for 3D-printed orthoses into the sandals.

OLT's Kickstarter page indicates the company will begin printing in August, with pricing starting a CA$159 a pair. Go to kickstarter.com or oltfoot.com to learn more. ler

Pairing Evenup lift, walking boot helps gait

The Journal of Allied Health in June published a study of Buford, GA-based Evenup's shoe lift, showing the device offered clinically meaningful improvements in lower extremity function and disability over usual care in individuals with temporary limb length inequality.

Investigators recruited 34 volunteers undergoing unilateral lower extremity orthopedic medical and rehabilitative care, assigning 17 to an intervention group using a walking boot on their involved side and an Evenup Shoe Balancer, which buckles over the user's normal shoe to provide a 1/2" to 1" lift, on the uninvolved foot. The control group used a walking boot and an unaltered shoe.

Outcome measures included the lower extremity functional scale (LEFS), modified Oswestry low back pain disability questionnaire (OSW), numeric pain rating scale, ankle range of motion (ROM), and strength. Function, pain, ROM, and strength improved in all participants, and investigators observed a clinically relevant improvement in OSW and LEFS in the intervention group, compared with controls. ler

Cure, GCI work to end clubfoot disability

New Cumberland, PA-based Cure International, along with its partners in the Oxford, UK-based Global Clubfoot Initiative (GCI), on June 3—World Clubfoot Day—launched a strategy to end worldwide clubfoot disability by 2030.

"Ending Clubfoot Disability: A Global Strategy to 2030" aims to ensure that by that year at least 70% of children born with clubfoot in lower- and middle-income nations can access treatment. Currently, fewer than 15% of children in these countries have access.

The partners will develop and support clubfoot programs with an investment of $160 million, making it possible to treat more than 1.2 million children. By avoiding clubfoot-related disabilities, these children will go on to generate $154 billion in additional lifetime earnings, according to a Cure release.

Go to cure.org/runfree2030 or globalclubfoot.com/runfree2030 for more information. ler

Sanford, UND plan ortho residency program

Sanford Health, based in Sioux Falls, SD, and the University of North Dakota (UND) School of Medicine and Health Sciences (SMHS) in Grand Forks, ND, announced in May the organizations are collaborating on an Orthopedic Residency Program set to begin in summer 2018.

The program is funded by Sanford Health and sponsored by the UND's SMHS. This first-of-its-kind program in North and South Dakota creates three residency positions per year in which residents will study and work with surgeons and providers in both Fargo and Sioux Falls, and will eventually have 15 residents training at a time during the five-year program, according to a joint release from the organizations.

"As a teaching hospital, Sanford is drawn to the importance of education and teaching tomorrow's physicians to prepare for the future needs of our community. We know that a majority of physicians stay and practice where they are trained," said Bruce Piatt, MD, UND SMHS Orthopedic Residency Program director.

Get more information on the program at sanfordhealth.org/orthoresidency. ler

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