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ANNIVERSARY

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LOWER EXTREMITY REVIEW

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DODGEBALL!

- INJURIES & STRATEGIES TO PREVENT THEM
- SHOES MATTER

- KNEE INJURY AT 80
- UTILITY OF SILVER ALGINATE
- MALNUTRITION & WOUND HEALING
- CARBON FIBER FOOTWEAR PLATES ARE NOT ALL ALIKE

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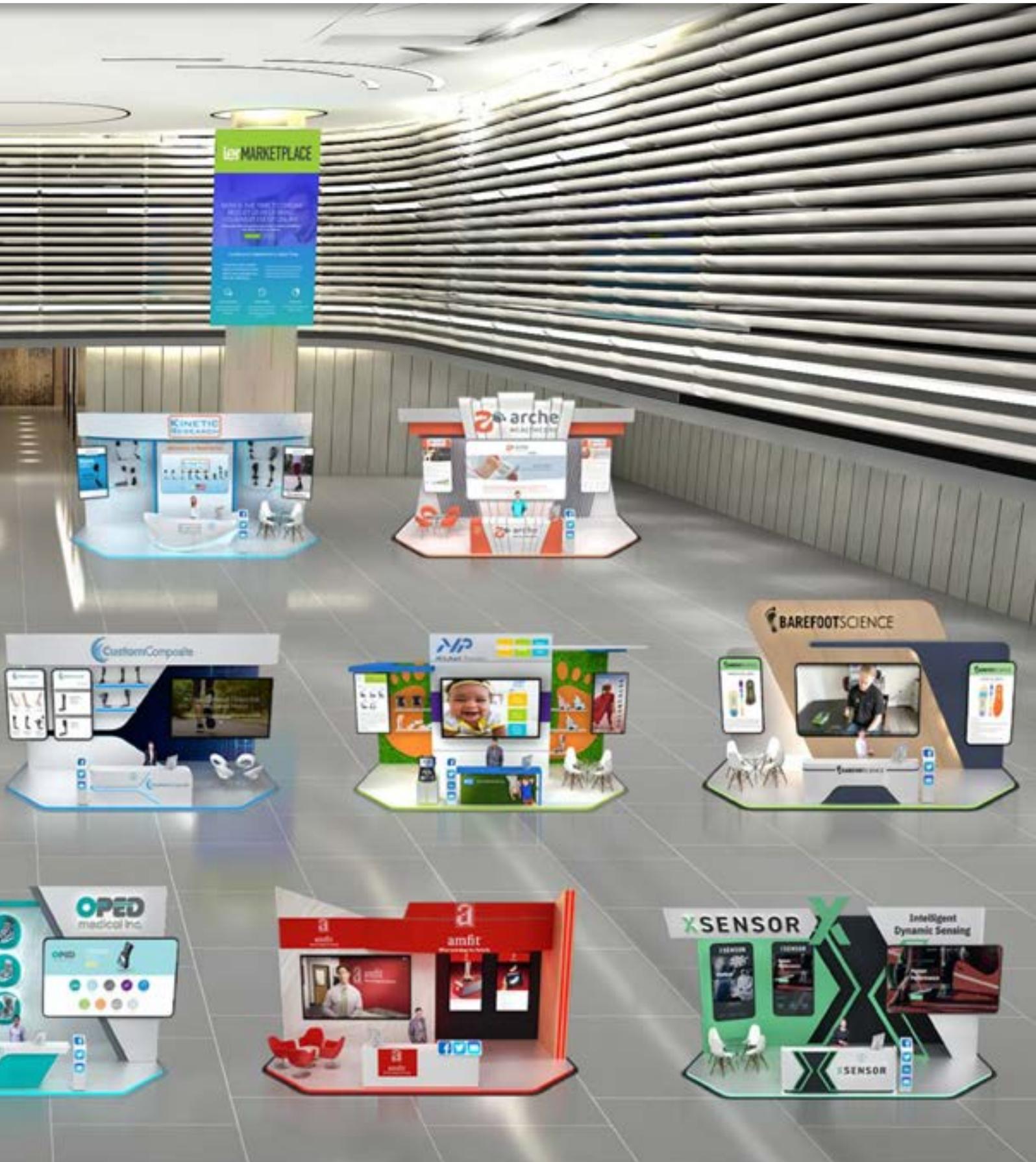
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EXPERT OPINION

9 THE PRODIGY SPORTS: EARLY SPECIALIZATION & POSSIBLE LONG-TERM CONSEQUENCES

Sports specialization at an early age does not lead to where many think it does.

By Robert Weil, DPM



PATIENT POINT OF VIEW

13 SURVIVING A KNEE INJURY AT 80

Having been a geriatric nurse practitioner for 20 years, she had vowed to keep fit and flexible. Then she did a lunge.

By Marianna Crane, retired



AD INDEX

57 GET CONTACT INFO FOR ALL OF OUR ADVERTISERS

NEW & NOTEWORTHY

58 PRODUCTS, ASSOCIATION NEWS & MARKET UPDATES

THE LAST WORD

62 EFFECTS OF MUSIC ON RESISTANCE EXERCISE PERFORMANCE

Pre-exercise music may provide small to substantial improvements in exercise performance.

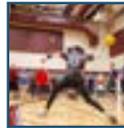
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COVER STORY

33 DODGEBALL-RELATED INJURIES OF THE LOWER EXTREMITY TREATED AT EMERGENCY DEPARTMENTS

Nearly one-third of all dodgeball injuries affect the lower extremity.

By Mathias B. Forrester, BS



Dodgeball photos courtesy of American Photographic and USA Dodgeball.

WOUND CARE UPDATE

23 THE UTILITY OF SILVER ALGINATE

Silver alginate dressings have antimicrobial activity against a wide variety of wound microbes including antibiotic resistant species.

By Windy Cole, DPM, CWSP



SHORTTAKES FROM THE LITERATURE

- 15 • Of Postage Stamps and Wearable Ultrasounds
- Exercise + Corticosteroid Injection = Better Outcome in Achilles Tendinopathy
- Importance of Alcohol in Falls
- Gluteus Medius Dry Needling for Patellofemoral Pain
- Maintaining Muscle Strength to Prevent Depression?
- Tissue Microenvironment in Rheumatoid Arthritis

FEATURES

27 STRATEGIES TO PREVENT LOWER EXTREMITY INJURIES COMMON IN DODGEBALL

Dodgeball—that game you either loved or hated as a kid—is gaining popularity with adults. Preventing injuries is key to long-term success.

By Brenda Kramer, BS



31 ODE TO DODGEBALL WARE: SHOES

...I had a bond with these shoes. They had picked me up off the bench of injuries and allowed me to play harder, longer and more times per week...

By Stacy Huen



43 MALNUTRITION: HOW IT AFFECTS WOUND HEALING IN THE ELDERLY

Malnutrition can negatively affect quality of life as well as healing times for wounds.

By Nancy Collins, PhD, RDN, LD, NWCC, FAND, and Ame Proietti



47 ALL CARBON FIBER FOOTWEAR PLATES ARE NOT ALIKE

Combining carbon fiber plate technology with the reverse ellipse spring to improve the 'push' performance of the US Olympic Bobsled Team results in new kind of orthotic device.

By Matthew Arciuolo, CPed, BOC





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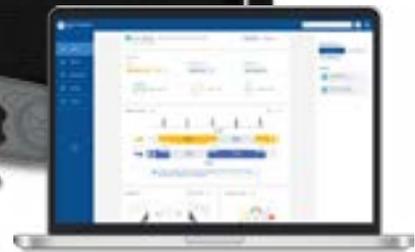
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LOWER EXTREMITY REVIEW

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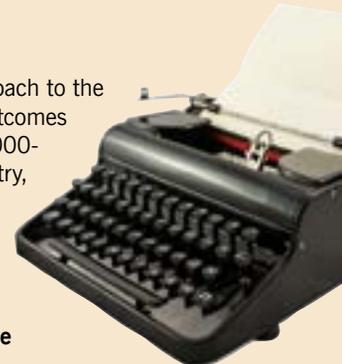
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Expert Opinion

The Prodigy Sports: Early Specialization & Possible Long-Term Consequences

BY ROBERT WEIL, DPM

What do I mean by the prodigy sports? Specifically, I'm talking about sports that involve adolescents and younger who are already focusing on and playing only one sport. It's a key chapter in my co-authored book, *#HeySportsParents*.¹ Sports like gymnastics and figure skating are good examples, but we could add soccer, tennis, volleyball, swimming, etc.! Most doctors, therapists, and trainers are unanimous in frowning on specializing in one sport too early, citing increased repetitive motion injuries from using the same muscles and movements compared to playing multiple sports that provide a variety of demands on their growing bodies.

Overuse injuries – both physical and mental – are already an epidemic in youth sports. Early specialization often increases these problems leading to mental burnout, stress, anxiety, and eating disorders from these pressures and demands. Surgeries can become a definite reality in physically grueling sports such as gymnastics. Many high-level gymnasts have surgical histories that make headlines: “Elbow Surgery Helps Young Gymnast Reach for Her Dreams” (age 12);² “Castaic teen gymnast receives cutting-edge hip surgery from Children’s Hospital LA” (age 17);³ “The Injured Should in High-Level Male Gymnasts, Part 2: Can Athletes Return to Competition After Surgery? (age range 16-23)”⁴ and “Young Gymnast First To Undergo Experimental Spine Surgery In Colorado.”⁵ Pain and problems later on in their 30s and older are not uncommon, including in these other prodigy sports. Dealing with these long-term post injury and surgery problems often becomes the future reality for serious young athletes.

Some parents and coaches think that young athletes will fall behind in development if they don't spend all their time and energy on that single sport. This has not proven true.



Too much training? Members of the Soviet women's gymnastics team training in 1991 in Moscow.

A great example is the former women's Gold Cup soccer team where over 75% of players grew up playing multiple sports, not just soccer! There are many other examples of sports stars in many sports with their history of variety. LeBron James wanted to play football at Ohio State University, but chose that other sport. Remember those letter sweaters? Ideally, young athletes can participate in different sports with their different experiences and physical demands, and then decide which is best for them by mid-teens or later. Then...it can be off to the races! Of course, I said ideally. Too often, club and traveling team coaches and parents push this specialization early idea, disregarding

its potential negative consequences. Sometimes it's the parent's goals, other times the club's financial interest. The prodigy sports again are a different challenge: everyone can tell the kid to play other sports but kids love their Fav! If that's the reality, I respect it. But there should be some new rules and challenges regarding schedules, training, and the importance of rest, recovery, and time off.

But Then, Later On...

Regarding pain and problems later on when their career is over, an interesting recent study looked at hundreds of former college gymnasts

Continued on page 11



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involving many with early injuries, many requiring surgery. Researchers found that those who started earlier had greater risk for surgery. Many later in their 30s dealt with pain and early arthritis or disability concerns. Other prodigy sports mentioned above might not have as many surgical injuries as gymnastics but often have the same future pain and wear-and-tear problems. The study also showed that even with early injuries that required surgery in these young gymnasts, it didn't necessarily relate to their later painful problems compared to those without surgery. They had been trained to accept and tune out pain—and they were still doing it! I asked a couple of my youth sports and gymnastics experts to chime in:

Robert Andrews, MA, LMFT, from Texas's Institute of Sports Performance in Houston, is a mental training specialist who's worked with the Olympic women's Gold Medalist gymnastics teams as well as other sports. He specializes in post injury and surgery mental challenges. He uses an "injury assessment" that takes a look at emotional and mental discomfort related to injury. It measures several different factors – anxiety, fear of re-injury, anger, frustration, and more. Interestingly, he often sees less future pain and problems when the athlete is aware of these factors and pays attention to them later in life.

Gina Pongetti, PT, MPT, MA, CSCS, of Illinois's Achieve Orthopedic Rehab Institute & Sports Medicine in the Chicago area, is a former high-level gymnast, award-winning physical therapist and performance consultant to these same Olympians and young stars. She also feels that "pain in the long-term is often associated with the psychology of the injury and how it was handled." Was the athlete yelled at, belittled by the coach, by their parents or teammates? She says these high-level gymnasts expect and are trained and schooled on ignoring and handling post injury or surgery pain.

This attitude of *no pain no gain, push through it, suck it up*, etc., by coaches, parents and the young athletes themselves has been a big contributor to the above-mentioned epidemic of youth sports overuse injuries both those that are physical and those that are mental. The

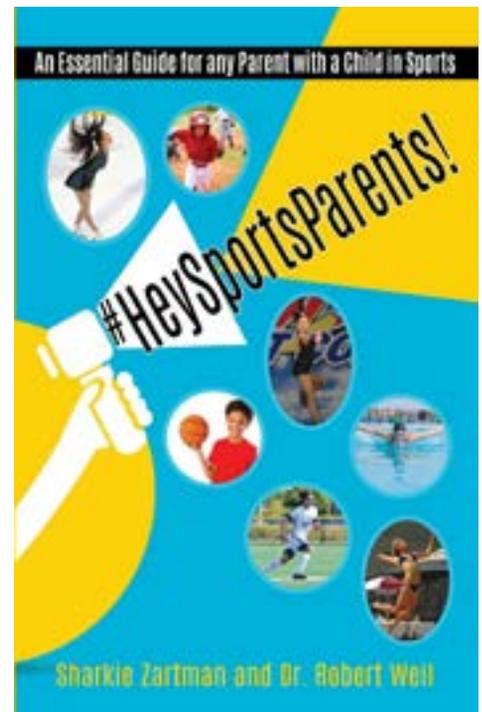
reliance on pain medicine to stay in the game, playing while hurt, and often masking injury problems is a nightmare we also addressed in the book.¹ My message to parents and coaches is this: if your young athlete needs pain meds to continue to participate at the same schedule and intensity – then the line has been crossed and everyone needs to back off for a reset. The injury needs to be examined by a doctor, trainer, or therapist and treatment needs to be initiated. Insisting on rest and recovery is crucial for the long-term health of the young athlete. So many minor overuse injuries can become chronic, even surgical, all because someone doesn't want to back off the schedule or intensity. Too often, it's "Doc – he's/she's got to play!"

There's no doubt that today's youth sports is too often big business with all the stresses and pressures we've mentioned. It ain't for everyone! Remember that the reality of a college scholarship, let alone a professional or Olympic career is very slim. Sports parents, coaches and the kids themselves need to be aware of this. When these young athletes, their parents and coaches become educated and are made aware of the challenges involved, everybody wins! 

Robert A. Weil is a sports podiatrist in private practice in Aurora, Illinois. He hosts The Sports Doctor, a live weekly radio show on bbsradio.com. His book, #HeySportsParents, written with Sharkie Zartman, is available on Amazon.com and ranks among the seller's top 100 books in both Children & Youth Sports (#59) and Children's Sports Coaching (#62). Dr. Weil was inducted into the prestigious National Fitness Hall of Fame in April 2019.

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Cutting-Edge Hip Surgery from Children's Hospital LA. ABC Eyewitness News. Posted Oct. 25, 2019. Available at <https://abc7.com/hip-displaysia-surgery-pain-sharp-near/5642919/>. Accessed Aug. 1, 2022.

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Surviving a Knee Injury at 80

BY MARIANNA CRANE, RETIRED

A month after my 80th birthday, I was doing a lunge. I bent my right knee and stretched out my left leg. My foot slipped. A sharp pain stabbed my knee. My leg buckled underneath me. If there was a popping sound, I didn't hear it.

The next day, after an X-ray and a physical assessment of my knee, the physician's assistant at an Ortho Urgent Care declared that I had injured the anterior cruciate ligament (ACL) and the medial collateral ligament (MCL).

Since there had been a rash of surgeries the day before, there was a limited number of knee braces. The technician found a large brace, but if I wanted a medium, which was my size, my husband and I would have to drive to another clinic. After spending 3 hours in the waiting room, I suggested we take the larger brace. Wearing a hinged T-scope knee brace, the straps pulled taut to fit my leg, I lumbered out of Urgent Care with future MRI and orthopedic physician appointments.

I had been a nurse over 40 years, and a geriatric nurse practitioner for the last 20 of those years. Aware of the aging process, I had vowed to keep strong and flexible. Over the next 2 weeks before the appointments, I watched YouTube videos about ACL and MCL care. Performing the simple exercises made me feel in control of my progress while waiting for a definitive diagnosis.

The MRI confirmed my ACL was partially torn and MCL fully torn. The orthopedic physician showed me MRI and X-ray pictures of my injury also pointing out age-related changes. I was to continue wearing the brace and make an appointment with physical therapy.

The minimalist exercises I had done kept my knee flexible, which impressed the physical therapist. Her exercise plan has improved my walking and mental outlook.

The brace seems to be part of my anatomy since I wear it constantly except when in bed. Now that my leg is no longer swollen, it slides



Mary Moore McLean Photography

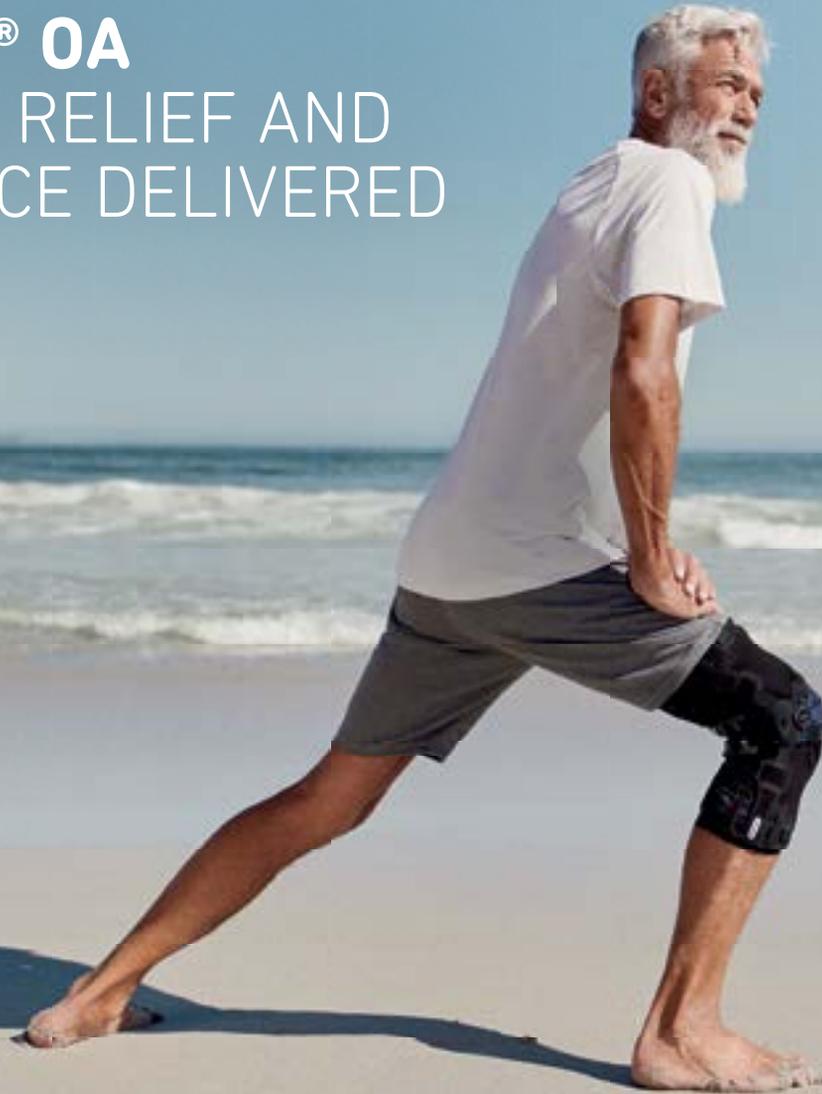
down and I'm forever adjusting the straps. I'm close to running out of space to attach the Velcro straps. In retrospect, we should have driven to the other clinic to get the correct size. I've been wearing the brace for over 2 months hoping it'll continue to keep my knee stable until no longer needed.

My knee injury isn't a death sentence. But as a geriatric NP, I know this type of mishap could make me susceptible to deconditioning,

loss of strength, and risk of falling. At each clinic visit, the receptionist puts a yellow "fall risk" bracelet on my wrist, reinforcing this belief. However, I have witnessed tenacity and determination in my elderly patients who overcame a variety of physical setbacks. I'm grateful not to have encountered ageism at any point in my treatment. Each of my healthcare providers has indicated that I should gain back strength and mobility and return to the level of physical capacity I had before the injury. 

"I know this type of mishap could make me susceptible to deconditioning, loss of strength, and risk of falling. At each clinic visit, the receptionist puts a yellow "fall risk" bracelet on my wrist, reinforcing this belief."

Marianna Crane trained as a nurse in the 1960's before becoming a geriatric nurse practitioner in 1981. Since retiring, she has focused on writing; her work has appeared in The New York Times, The Eno River Literary Journal, Examined Life Journal, Hospital Drive, and others. Her book, Stories from the Tenth-Floor Clinic, can be found on IndieBound, Amazon, and Barnes & Noble. She blogs at nursingstories.org.


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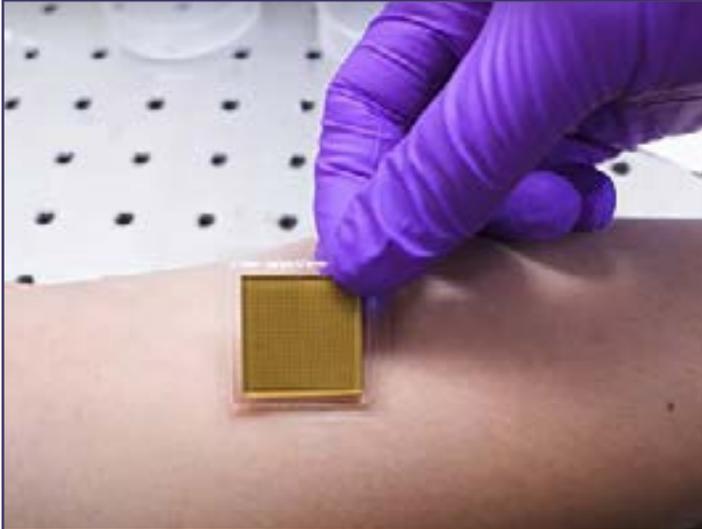
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Several research groups have been seeking more versatile approaches to noninvasive ultrasound—approaches that would allow longer-term monitoring in a variety of settings via wearable devices. To date, most of these efforts have provided relatively low-resolution images or are unable to visualize deep tissues or organs.

Now, an NIH-funded research team led by Dr. Xuanhe Zhao at the Massachusetts Institute of Technology has developed a new type of wearable ultrasound patch that overcomes many of the limitations of earlier approaches. This multi-layered device is about the size of a thick postage stamp, and it adheres to skin in both wet and dry environments.

Traditional ultrasound works by sliding a probe over the intended spot on the body. The probe emits high-frequency sound waves through the skin that bounce off internal tissues, creating echoes that are captured and transmitted to instruments that translate the data into pictures or videos. A soft gel applied between the skin and probe helps to enhance soundwave transmission.

The patch created by Zhao's team used several advanced techniques to combine all of these ultrasound components in a miniature package. A thin, rigid array of ultrasound probes sits atop a tough but flexible hydrogel layer. An elastomer membrane protects the hydrogel from drying out, and a bioadhesive binds the probe strongly to skin. The combination of a rigid probe array and flexible hydrogel-elastomer layers enables more stable and higher-resolution imaging than other wearable ultrasound devices that are thin and stretchy.

The researchers tested the patch on 15 human volunteers. They showed that the device could be comfortably worn for at least 48 hours. Depending on placement, the patch could provide continuous imaging

of blood vessels, heart, muscle, diaphragm, stomach, or lung. The heart or lungs could be stably and continuously imaged even while volunteers were jogging or cycling.

Despite the patch's potential for on-the-fly mobile imaging, the device currently must be hooked to computer systems for intensive data processing. But Zhao and his team foresee future possibilities:

"We envision a few patches adhered to different locations on the body, and the patches would communicate with your cellphone, where AI algorithms would analyze the images on demand," Zhao says. "We believe this represents a breakthrough in wearable devices and medical imaging." ^(ler)

Source: Wang C, Chen X, Wang L, Makihata M, Liu H-C, Zhou T, Zhao X. Bioadhesive ultrasound for long-term continuous imaging of diverse organs. Science. 2022;377(6605):517-523. doi: 10.1126/science.abo2542.

EXERCISE + CORTICOSTEROID INJECTION = BETTER OUTCOME IN ACHILLES TENDINOPATHY



The combination of exercise therapy and corticosteroid injection is more effective than exercise therapy alone in patients with long-standing Achilles tendinopathy, according to a new study from Denmark.

In this randomized controlled trial of 100 patients with long-standing ultrasound-verified Achilles tendinopathy (range 20 – 26 months), researchers divided the participants into 2 groups. Assessment of pain and function were conducted at baseline and at 1, 2, 3, 6, 12, and 24 months. After an initial clinical examination, the control group received

Continued on page 17

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1mL of lipid emulsion and 1mL of lidocaine (10mg/mL) (placebo injection), and the intervention group received 1mL of methylprednisolone acetate (40mg/mL) and 1mL of lidocaine (10mg/mL) (corticosteroid injection). Up to 3 injections were offered, at least 4 weeks apart. Exercise therapy was based on previous trials using a 3-month heavy slow resistance program consisting of 3 different heel-rise exercises done every second day (3x wk), with the number of repetitions decreasing as the load increased.

The primary outcome was the Victorian Institute of Sports Assessment–Achilles (VISA-A) score (range, 1–100, with 100 representing no symptoms) at 6 months. Secondary outcomes included pain measured using a 100-mm Visual Analog Scale for morning pain and pain during exercise (with higher scores indicating worse pain), global assessment (Likert scale), and tendon thickness.

At baseline, participants in both groups had similar VISA-A scores of 46 (SD, 18). At 6 months, the group that received the corticosteroid injection had a 17.7-point ($P < .001$) larger improvement in VISA-A score compared with the control group. No severe adverse events were observed in either group, and there was no deterioration in the 2-year long-term follow-up.

Among the secondary objectives, ultrasound-measured thickness of the Achilles tendon improved significantly more in the group that received the corticosteroid injection. Mean difference between groups was 1.9mm at 1 month ($P < .001$), 2.2 mm at 2 months ($P < .001$), 2.2 mm at 3 months ($P < .001$), and 1.0 mm at 6 months ($P < .02$).

Having recorded both statistically and clinically relevant improvements in the group that received the combination of exercise therapy and the corticosteroid injection, the study authors concluded that the effects are visible at both short-term and long-term follow-up and should be incorporated into the management of long-standing Achilles tendinopathy. 

Source: Johannsen F, Olesen JL, Øhlenschläger TF, et al. Effect of ultrasound-guided corticosteroid injection vs placebo added to exercise therapy for Achilles tendinopathy: a randomized clinical trial. *JAMA Netw Open.* 2022;5(7):e2219661. doi: 10.1001/jamanetworkopen.2022.19661.

IMPORTANCE OF ALCOHOL IN FALLS

Fall injuries account for a substantial part of the health burden among elderly persons, and they often affect life quality severely and impose large societal costs. Alcohol intoxication is a well-known risk factor for accidental injuries, but less is known about this association among elderly people. The aim of this study was to assess whether risk of fall injuries among the elderly is elevated with an intoxication-oriented drinking pattern.

These researchers applied a population case-control design using data from persons age 60 years and over in Norway. Cases comprised patients with fall injuries admitted to a hospital emergency department (n



= 424), and controls were participants in general population surveys (n = 1859). Drinking pattern was assessed from self-reports of drinking frequency and intoxication frequency. Age and gender-adjusted association between fall injury and drinking pattern was estimated in logistic regression models. Fall injuries were considered alcohol-related if blood alcohol concentration exceeded 0.01% and/or the patient reported alcohol intake within 6 hours prior to injury.

These results showed that the risk of fall injuries was highly elevated among those reporting drinking to intoxication monthly or more often (OR = 10.2, 95% CI 5.5–19.0). Among cases, the vast majority of those with alcohol-related fall injuries (64 of 68) reported drinking to intoxication.

A drinking pattern comprising alcohol intoxication elevated the risk of fall injuries among elderly people. As alcohol use is a modifiable risk factor, the findings suggest a potential to curb the number of fall injuries and their consequences by employing effective strategies to prevent intoxication drinking among the elderly. In general, screening and brief intervention in primary and some specialty healthcare services have been shown to be an effective measure to reduce hazardous drinking, and as these healthcare services are widely used among the elderly, these settings seem promising for identifying and modifying hazardous drinking in this age group. Also in the specialist health services, brief interventions, including motivational interviewing, seem a promising strategy to reduce hazardous drinking in cases of alcohol induced, or related, health harms. In this respect, findings in this study suggest that identification of fall-injured patients with a positive blood alcohol screen and/or report of alcohol consumption shortly prior to the injury, appears to be an appropriate point of departure for such intervention. 

Source: Bye EK, Bogstrand ST, Rossow I. The importance of alcohol in elderly's hospital admissions for fall injuries: a population case-control study. *Nordisk Alkohol Nark.* 2022;39(1):38–49. doi: 10.1177/14550725211015836.



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GLUTEUS MEDIUS DRY NEEDLING FOR PATELLOFEMORAL PAIN



One of the most common knee problems is patellofemoral pain syndrome (PFPS)—accounting for 25% to 40% of knee problems. It is of great importance to pay attention to the muscles of the hip area in people with PFPS, especially to the presence of trigger points within the gluteus medius (GM). Accordingly, using therapeutic interventions to eliminate trigger points is required. Therefore, the aim of the present study was to evaluate the effect of GM active trigger point dry needling (TrP-DN) on pain and physical function of non-athlete women with unilateral PFPS.

29 young non-athlete women aged between 17 and 40 years old with unilateral PFPS were randomly divided into 2 groups of experimental ($n = 15$) and control ($n = 14$) through the simple and convenience sampling method. Both groups received conventional physiotherapy twice a week up to 6 sessions. The experimental group also received GM active TrP-DN once a week for 3 sessions in addition to the conventional physiotherapy. Pain intensity and physical function of women with PFPS were measured in both groups in 3 stages of before, immediately after, and one week after performing the treatment sessions.

The six-session physiotherapy treatment led to a significant reduction in pain intensity as well as an improvement in physical function in both groups ($P < 0.001$). In addition, the intergroup comparison showed a significant improvement in physical function of the experimental group after one week from the GM active TrP-DN, compared to the control group ($P = 0.048$).

The present study indicated that conventional physiotherapy with or without GM active TrP-DN can reduce pain and improve physical function in non-athlete women with unilateral PFPS. This study also revealed that conventional physiotherapy combined with dry needling can lead to further reduction in pain and a greater improvement in physical function of this group of patients. 

Source: Karamiani F, Mostamand J, Rahimi A, Nasirian M. The effect of gluteus medius dry needling on pain and physical function of non-athlete women with unilateral patellofemoral pain syndrome: a double-blind randomized clinical trial. J Bodyw Mov Ther. 2022;30:23-29. doi: 10.1016/j.jbmt.2022.02.005.

MAINTAINING MUSCLE STRENGTH TO PREVENT DEPRESSION?



Depression and anxiety are the leading mental health problems worldwide; depression is ranked as the leading cause of global disability with anxiety disorders ranked sixth. Preventive strategies based on the identification of modifiable factors merit exploration. The aim of the present study was to investigate the associations of handgrip strength (HGS) with incident depression and anxiety and to explore how these associations differ by sociodemographic, lifestyle, and health-related factors.

The analytic sample comprised 162,167 participants (55% women), age 38–70 years, from the UK Biobank prospective cohort study. HGS was assessed at baseline using dynamometry. Depression and anxiety were extracted from primary care and hospital admission records. Cox proportional models were applied, with a 2-year landmark analysis, to investigate the associations between HGS and incident depression and anxiety.

Of the 162,167 participants included, 5462 (3.4%) developed depression and 6614 (4.1%) anxiety, over a median follow-up period of 10.0 years (inter-quartile range: 9.3–10.8) for depression and 9.9 (inter-quartile range: 9.0–10.8) for anxiety. In the fully adjusted model, a 5 kg lower HGS was associated with a 7% (HR: 1.07 [95% CI: 1.05, 1.10]; $P < 0.001$) and 8% (HR: 1.08 [95% CI: 1.06, 1.10]; $P < 0.001$) higher risk of depression and anxiety, respectively. Compared with participants in the sex and age-specific highest tertiles of HGS, those in the medium and lowest tertiles had an 11% (HR: 1.11 [95% CI: 1.04, 1.19]; $P = 0.002$) and 24% (HR: 1.24 [95% CI: 1.16, 1.33]; $P < 0.001$) higher risk of depression and 13% (HR: 1.13 [95% CI: 1.06, 1.20]; $P < 0.001$) and 27% (HR: 1.27 [95% CI: 1.19, 1.35];

Continued on page 21

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$P < 0.001$) higher risk of anxiety, respectively. The association of HGS with depression was stronger among participants with average or brisk walking pace (vs. slow walking pace; $P_{\text{interaction}} < 0.001$). The association with anxiety was stronger in those participants age ≥ 58 years (vs. ≤ 58 years; $P_{\text{interaction}} = 0.002$) and those living in more affluent areas (vs. deprived; $P_{\text{interaction}} = 0.001$).

Handgrip strength was inversely associated with incident depression and anxiety. Because HGS is a simple, non-invasive, and inexpensive measure, it could be easily used in clinical practice to stratify patients and identify those at elevated risk of mental health problems. However, future research should assess if resistance training aimed at increasing HGS can prevent the occurrence of mental health conditions. 

Source: Cabanas-Sánchez V, Esteban-Cornejo I, Parra-Soto S, et al. Muscle strength and incidence of depression and anxiety: findings from the UK Biobank prospective cohort study. *J Cachexia Sarcopenia Muscle*. 2022 Aug;13(4):1983-1994. doi: 10.1002/jcsm.12963.

TISSUE MICROENVIRONMENT IN RHEUMATOID ARTHRITIS

The recent advance in treatments for rheumatoid arthritis (RA) has significantly improved the prognosis of RA patients. However, these novel

therapies do not work well for all RA patients. The unmet need suggests that the current understanding about how inflammatory response arises and progresses in RA is limited. Recent accumulating evidence reveals an important role for the tissue microenvironment in the pathogenesis of RA.

The synovium, the main tissue where the RA activity occurs, is composed by a unique extracellular matrix (ECM) and residing cells. The ECM molecules provide environmental signals that determine programmed site-specific cell behavior. Improved understanding of the tissue microenvironment, especially how the synovial architecture, ECM molecules, and site-specific cell behavior promote chronic inflammation and tissue destruction, will enhance deciphering the pathogenesis of RA. Moreover, in-depth analysis of tissue microenvironment will allow us to identify potential therapeutic targets.

Research is underway to explore potential candidates, both cellular and ECM molecules, to develop novel therapies. This article reviews recent advances in knowledge about how changes in cellular and ECM factors within the tissue microenvironment result in propagation of chronic inflammation in RA. 

Source: Cheng CF, Liao HJ, Wu CS. Tissue microenvironment dictates inflammation and disease activity in rheumatoid arthritis. *J Formos Med Assoc*. 2022;121(6):1027-1033. doi: 10.1016/j.jfma.2022.01.026.

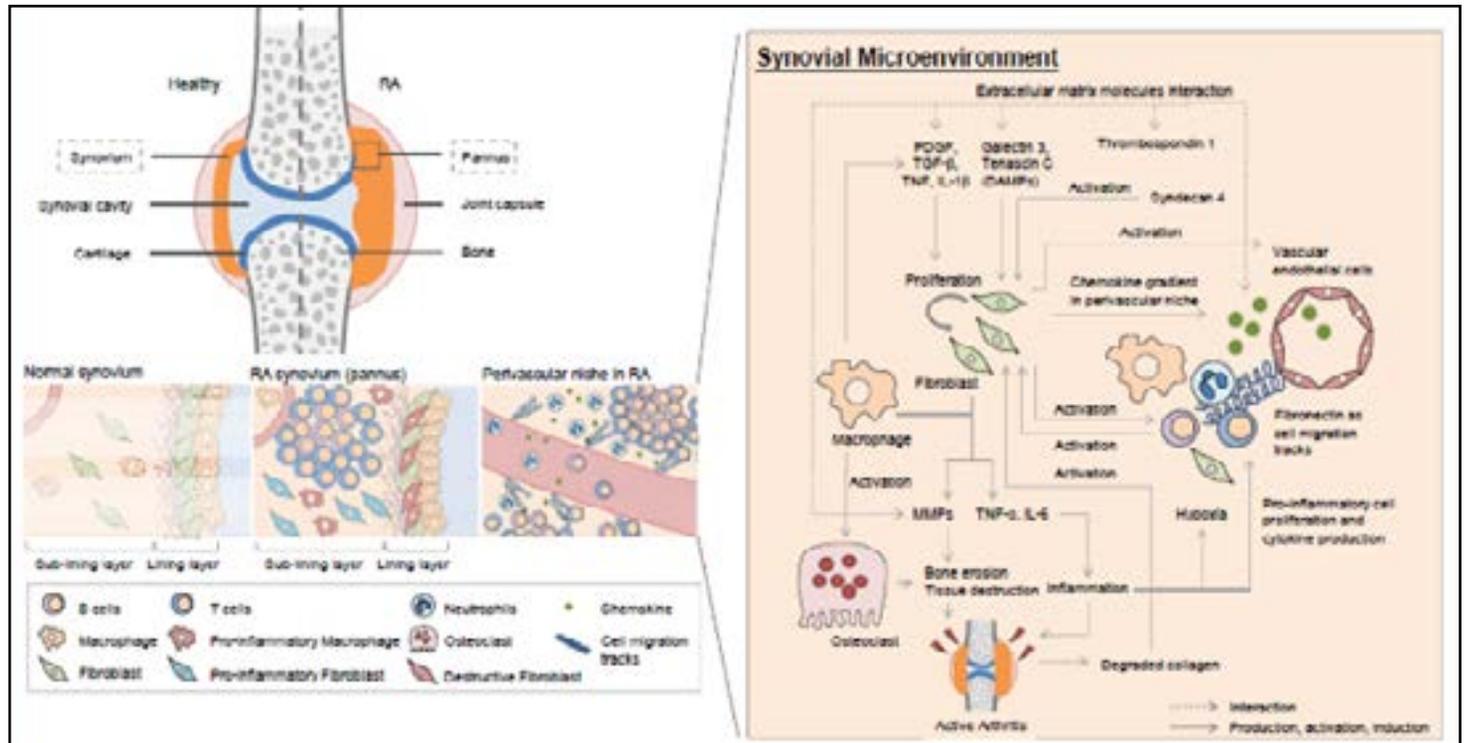


Figure. Synovial microenvironment in the healthy and RA joint. The synovium is composed of a lining layer and a sub-lining layer. Synovial fibroblasts and synovial macrophages constitute the lining layer. The sub-lining layer comprises a loose, highly innervated, and vascularized ECM with the residing cells. In addition to immune cells, synovial fibroblasts, synovial macrophages, and ECM molecules participate in the precipitation of chronic inflammation in the RA synovium. The ECM molecules also maintain the chronic inflammation in RA synovium. Thrombospondin 1, an ECM molecule with increased expression in RA, interacts with other ECM molecules and modulates their activity and function. The increasing galectin 3, tenascin C, and syndecan 4 activate synovial fibroblasts, which produce MMPs, TNF- α , and IL-6. TNF- α and IL-6 induce inflammation and further tissue hypoxia. On the other hand, the MMPs degrade the ECM and result in tissue destruction. The degraded collagen released from damaged tissue activates synovial fibroblast more efficiently than intact collagen. DAMP, damage associated molecular pattern; ECM, extracellular matrix; MMP, matrix metalloproteinases; RA, rheumatoid arthritis.

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The Utility of Silver Alginate

BY WINDY COLE, DPM, CWSP

Exudate management is a common clinical concern when treating chronic wounds. Excessive wound leakage can be harmful to peri-wound skin¹ and can require more frequent dressing changes. These dressing changes can damage tissue, be painful to the patient, and utilize nursing time, thereby increasing nursing costs. A dressing that is absorbent and requires minimal dressing changes could improve wound healing, while reducing patient discomfort and nursing costs.² It is therefore essential that wound dressings used in the management of chronic wounds have effective antimicrobial properties and optimally manage exudate.

Silver alginate dressings are a class of advanced antimicrobial wound dressing that has been developed for the management of moderately to heavily exuding chronic wounds. Most silver alginate dressings are comprised of a hydrofiber that helps maintain optimal moisture balance, ionic silver, which has a broad spectrum of antimicrobial activity, and may contain other enhancing agents which further increase the antimicrobial activity of the silver.³⁻⁶ In vitro studies have demonstrated that silver alginate dressings have antimicrobial activity against a wide variety of wound microbes commonly associated with wound colonization and infection including antibiotic resistant species.

Case Study

A 65-year-old female with a 6-week history of ulcer of the lower leg presented at my outpatient wound care center. She had previously been self-treating the wound with over-the-counter antibiotic ointment. Her medical history included breast cancer, hyperlipidaemia, and hypertension. Her ankle brachial pressure index was 1.08. The wound measured 5.3x2.7x0.1cm and was producing a moderate volume of malodorous serosanguinous exudate. The wound had a



Figure 1



Figure 2



Figure 3

mix of devitalized tissues present on the wound bed, with distinct wound edges and intact peri-wound skin (Figure 1). Patient rated her pain a 5 out of 10. The drainage and malodour were having a negative effect on her quality of life. Patient was treated with a silver alginate under a multilayer compression dressing.

After one week, the wound size had reduced to 3.8x1.2x0.0cm. Granulation tissue was visible on the wound base and a great deal of the wound was now covered with epithelial tissue (Figure 2). There was less serous discharge and no malodour. Patient rated pain at 2 out of 10 and did not experience any pain at dressing changes. The wound edges and peri-wound skin was healthy and intact without maceration. Silver alginate was reapplied under compression bandage.

Upon evaluation on week 2 it was noted the wound was completely covered with epithelial tissue (Figure 3).

Indications for Silver Alginate Dressings

- Wounds where there is an infection or an increased risk of infection
- Wounds that may require a barrier to

microbial penetration of the dressing as this may reduce infection risk

- Diabetic foot ulcers, leg ulcers (venous stasis ulcers, arterial ulcers and leg ulcers of mixed aetiology), and pressure ulcers (partial and full thickness)
- Surgical wounds
- Traumatic wounds
- Oncology wounds with exudate, such as fungoids-cutaneous tumors, fungating carcinoma, cutaneous metastasis, Kaposi's sarcoma and angiosarcoma
- Wounds where the presence of microorganisms is a suspected cause of (or a factor in) chronicity/non-progression
- Partial thickness burns and donor sites 

Windy Cole, DPM, CWSP, is an adjunct professor and Director of Wound Care Research at Kent State University College of Podiatric Medicine. Dr Cole also serves as the National Director of Professional Development and Clinical Education for Woundtech. She is board certified by the American Board of Foot and Ankle Surgery and the American Board of Wound Management. She is a wound care advocate on the forefront of wound research and was the 2020 World Union

Continued on page 23



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of Wound Healing Silver Medal Award recipient for her work in Technology-driven Research. And she is a member of the LER Editorial Advisory Board.

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Beezer AE, Gaisford S. An in vitro test of the efficacy of an anti-biofilm wound dressing. *Int J Pharm*. 2014;474(1-2):177-81.

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Suggested Further Readings

Barbu A, Neamtu B, Zăhan M, Iancu GM, Bacila C, Mireșan V. Current trends in advanced alginate-based wound dressings for chronic wounds. *J Person Med*. 2021;11(9):890. doi.org/10.3390/jpm11090890.

Recent advances in biopolymer-based materials for wound healing highlight the performance of specific types of alginates. This paper explores the roles of alginates in advanced wound-dressing forms with a particular emphasis on hydrogels, nanofibers networks, 3D-scaffolds or sponges entrapping fibroblasts, keratinocytes, or drugs to be released on the

wound-bed. The latest research reports are presented and supported with in vitro and in vivo studies from the current literature.

Varela P, Marlinghaus L, Sartori S, Viebahn R, Salber J, Ciardelli G. Response of human macrophages to clinically applied wound dressings loaded with silver. *Front Bioeng Biotechnol*. 2020;8:124. doi: 10.3389/fbioe.2020.00124.

This publication explores the effect of the silver impregnated wound dressings on the immunomodulation of macrophages, the main immune cell population participating in the wound repair process. In this work, 3 different clinically applied antimicrobial, silver-impregnated wound dressings were investigated. Antimicrobial susceptibility tests, cell viability evaluation, and experiments to determine macrophage polarization were performed to evaluate both safety and efficacy.

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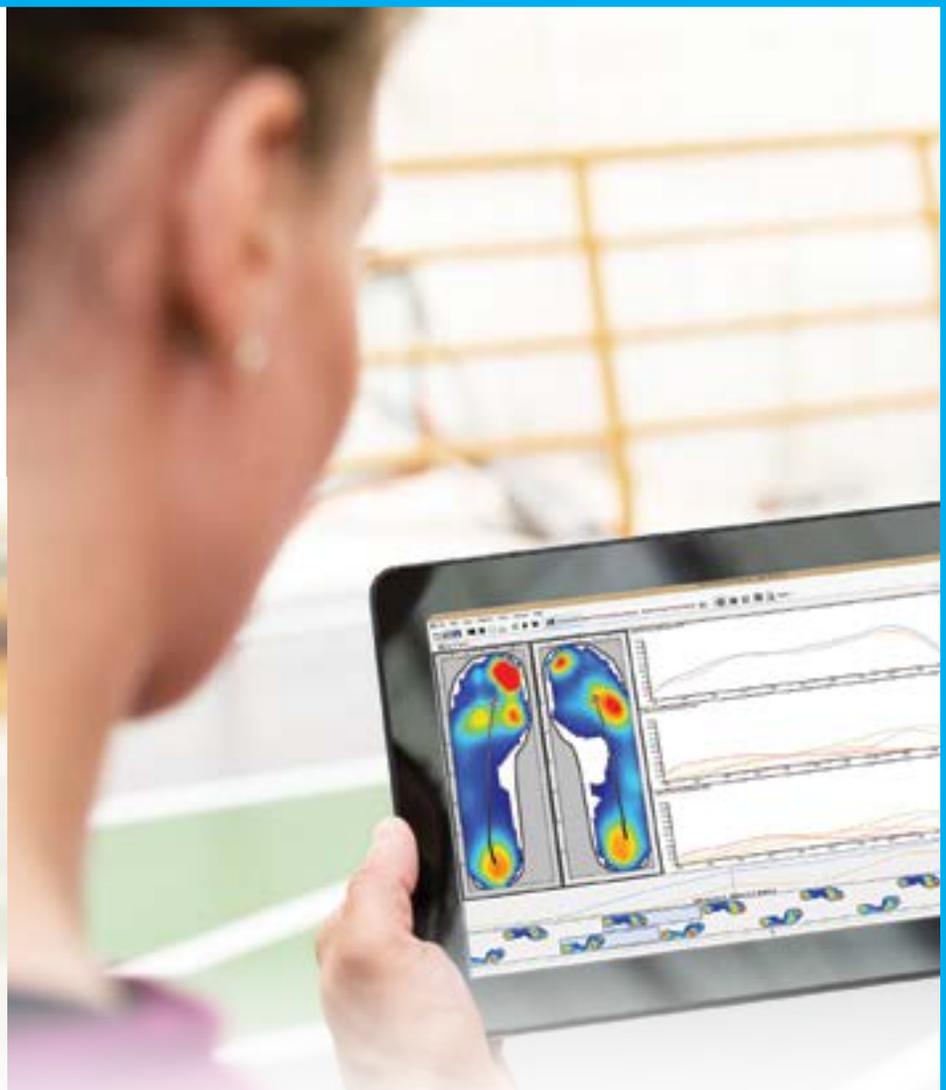


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Strategies to Prevent Lower Extremity Injuries Common in Dodgeball

BY BRENDA KRAMER, BS

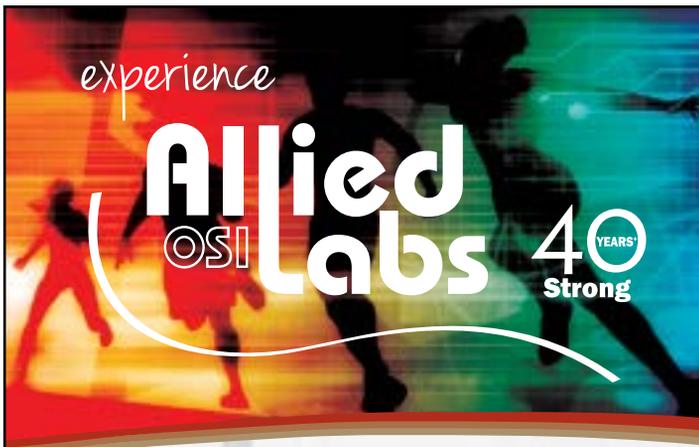
Dodgeball is a unique sport – it challenges a player's every energy intermittently. Can you throw from a backwards turn mid-air and hit the opposing player in such a way that he or she can't catch the ball – all while dodging incoming balls from the opposing team – and then run to the back of the court and stop?

In dodgeball, especially at the elite or semi-pro level, there's a lot of stop and go, great intensity then stop. Complex physical moves – jump, twist, dodge, throw, land, run, stop – sometimes done simultaneously, other times played out like a slow waltz as you move around the court. It's an intermittent sport, sort of like tennis, perhaps more like volleyball...bottom line, it requires a lot of physicality from each player as well as endurance to last through a match. That's what makes it so much fun to play, yet complex to train for.



Photos courtesy of American Photographic and USA Dodgeball.

Continued on page 28



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As a trainer, my goal is to marry personal fitness with the sport's required skills to help dodgeball players improve their performance. Despite the many stops and starts, dodgeball is a game of movement, of quick reflexes, because even when standing still, dodging incoming balls is still a must. And with all that, multi-directional movement comes the risk of injury, so it is crucial to train players through similar movement patterns utilizing the parts of the body that are frequently taxed while playing.

For me, prevention is about being prepared, making sure all the tissues are prepared for dodgeball movements. Like every other sport, warm-up is key. Stretches that involve all the major muscle groups are pretty standard. My favorites include dynamic movements such as walking knee hugs, traveling lateral lunges, and the World's Greatest stretch, which is essentially a combination of stretching the hip flexors, quadriceps, and gastrocnemius and soleus, while incorporating thoracic spine and shoulder mobility as well. These warm-up movements are my favorite because they incorporate full body mobility, they increase blood flow to large muscle groups (such as the quadriceps and hamstrings), and they allow players to feel more flexible prior to picking up a ball.

Dodgeball involves a lot of quick reflexes, players have to react to multiple balls being thrown simultaneously, so body control is an important component of preparation. To support stability and control in multi-directional movement, I have players focus on balance and single leg movements. Examples of lower body exercises that I frequently use with my dodgeball clients include plyometric movements such as power skips, skater hops, and lateral bounds. In regards to increasing single-leg strength, I like to incorporate single-leg box squats, single-leg or b-stance Romanian Deadlifts (RDLs), or single-leg step-ups onto a box.

But preparation isn't just before the game, it should be happening frequently during training before tournaments, focusing on lower body strengthening, plyometrics, and power exercises to build a strong foun-



dition. Additionally, it is important to also incorporate some forms of both anaerobic and aerobic training into a dodgeball player's programming. That can include sprint training, focusing on acceleration and lasting about 5-10 seconds, or longer distance runnings to build an aerobic base. Dodgeball is a quick moving, intermittent game, but the matches can be long and the players with endurance are the ones who can still run and throw with full power even after 40 minutes of active play.

The foot movements in dodgeball can be quick, so strong ankles and feet are important. Like most other sports, a proper warm up with stretching before the game starts is the key to keeping ankles and feet safe. I encourage my clients to improve ankle strength and flexibility by doing targeted exercises throughout the workout week in addition to rolling out the feet or even working out barefoot at times. Examples of exercises I use with my clients include banded stretches to increase ankle dorsiflexion (which is crucial for movements such as jumping and squatting), calf raises and isometric holds in a split squat position, and big toe doorway stretches.

Prevention also includes proper equipment for the skills required. For those with weak ankles or chronic ankle instability, ankle braces should be considered, but the main focus should be to strengthen lower limb muscles and ligaments during training in order to avoid bracing while playing. Additionally, proper footwear is required while playing. Some players prefer shoes with high ankle support such as standard basketball shoes, while others prefer lower cut shoes such as volleyball and indoor soccer shoes. It all depends on comfort level as well as lower limb stability. 

Brenda Kramer is a certified personal trainer with a Bachelor's degree in kinesiology from Whittier College. She is a member of Team USA Dodgeball (2019, 2022). Find her on Instagram @brendakramer.

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Ode to Dodgeball Wargear: Shoes

BY STACY HUEN

Pairing an activity to the right pair of shoes is incredibly important. It is so important that I wish I had taken it more seriously when I first started playing dodgeball.

When you go to a shoe store and tell them you need shoes for dodgeball, they often recommend trainers, or tennis-style shoes. Depending on your type of play, I really do not recommend this. Don't be an idiot (like I was) and wear skateboarding shoes, this will not end well – I now have a permanent injury on my right foot (big toe) after landing awkwardly from a jump in improper shoes.

Once I recovered from the initial injury where I had a toe severely bruised and wrecked tendon on the top of my big toe, I went to a friend who is a sneaker-head and asked for his advice. He said I should be wearing basketball shoes. They have grip, ankle support for lateral movements, and cushioning for jumps. Despite their high cost (~\$160 CAD back in 2013) I bought my first pair of Jordans. I got the Melo M9 edition, and they were the best shoes I ever owned.

Those shoes stood up to nearly 500 games of dodgeball (3 games/week for 2 years and 5 games/week for a year) and only started to show wear 3 years of abuse later. They were the only shoes I could wear that did not hurt my toe, and they allowed me to play aggressively and pain-free.

When I started considering replacing my M9s, it struck me – I had a bond with those shoes. They had picked me up off the bench of injuries and allowed me to play harder, longer, and more times per week. They saw me progress from having the weakest throw on my team to the strongest. They were there with me before I started Dodgeball Winnipeg! But once they started to squeak, were fully scuffed, and had a deep groove in the sole from where I dug in my toes, I knew it was time to look at finding their successors.



The author's Jordans after ~500 games.

It is funny to remember how hard it was to replace such a great pair of shoes, but it was important too that I kept my feet in prime shape so I could continue to play and grow as an athlete. I did some preliminary scouting, tried on some Lebrons, and Jordan Melo M11s and M12s, but none of them felt quite right. And I saw a lot of people complaining about going through shoes at an astounding rate (~50 games per pair) but their shoes were less than \$50/pair. I quickly realized you really do get what you pay for with shoes, and I cannot stress enough that you get proper footwear.

In my opinion, if you want to succeed at playing dodgeball, you should be buying the best quality basketball shoes you can afford.

The cost per game is dramatically lower and your body will thank you. This was true when I had to replace those original Jordans, and it is still true today. 

Stacy Huen was the founder and managing director of Dodgeball Winnipeg (dodgeballwinnipeg.com), which runs local/regional dodgeball leagues, tournaments, and drop-in events and serves as organizing bodies for the sport in Canada. Huen had to retire from dodgeball in 2021 due to complications from another injury. This article is an update of his original blog post from March 2016 titled, "Wargear Wednesdays: Shoes," which can be found at <https://dodgeballwinnipeg.com/2016/03/09/wargear-wednesday-shoes/>

Dodgeball-Related Injuries of the Lower Extremity Treated at Emergency Departments

BY MATHIAS B. FORRESTER, BS

Background: In the United States (US), concerns have been raised in recent years about children playing dodgeball while at the same time the sport has become increasingly popular among adults. The objective of this study was to describe dodgeball-related injuries of the lower extremity treated at US hospital emergency departments (EDs).

Methods: An analysis was performed of dodgeball-related injuries of the lower extremity using data from the National Electronic Injury Surveillance System (NEISS) during 2000-2021.

Results: An estimated 48,389 dodgeball-related injuries of the lower extremity were treated at US hospital EDs during 2000-2021. The estimated annual number of injuries increased from 821 during 2000 to 3,233 during 2010, fluctuated between 2,035 and 3,264 during 2011-2019, declined to 800 during 2020, then increased to 1,721 during 2021. The patient age distribution was 0.1% 0-5 years, 39.5% 6-12 years, 47.1% 13-19 years, and 13.3% 20 years or older; 66.1% of the patients were male. The most common injuries were sprain or strain (57.1%), fracture (17.6%), and contusion or abrasion (9.8%). The most frequently affected lower extremity body part was the ankle (41.5%), knee (27.6%), and foot (17.4%). The patient was treated or evaluated and released from the ED in 98.2% of the estimated injuries.

Conclusions: After increasing during 2001-2006, the annual estimated number of lower extremity injuries remained relatively stable until 2020. The most frequently reported injuries were a strain or sprain followed by fracture and contusion or abrasion. The majority of patients were treated and released from the hospital ED.

Dodgeball is a sport played by two teams. Players throw balls at the members of the opposing team, trying to hit them, while avoiding being hit themselves. The objective of the game is to eliminate all of the members of the opposing team by hitting them with thrown balls, catching a ball thrown by an opponent, or forcing a violation of the rules by an opponent.

Issues relating to bullying have been raised about playing of

dodgeball in schools.^{1,2} The National Association for Sport and Physical Education (NASPE) issued a position statement in 2006 that dodgeball was not an appropriate activity for K-12 school physical education programs.³ Dodgeball has been banned in some United States (US) school districts.^{4,5}

At the same time, dodgeball has become increasingly popular among adults.⁵ The Sport and Social Industry Association reported in 2014 that adult dodgeball participation had grown 20% annually over the previous 3 years.⁶ Organized dodgeball is played by tens of thousands of adults in the US.⁷

Literature on injuries that occur while playing dodgeball is limited.⁸⁻¹¹ A study of dodgeball-related injuries treated at hospital emergency departments (EDs) found that an estimated 185,000 such injuries occurred in the US during 2001-2018.¹² Approximately 21.4% of dodgeball-related injuries among children and 31.5% of the injuries among adults affected the lower extremity. The intent of this study was to characterize dodgeball-related injuries of the lower extremity reported to US hospital EDs.

Methods

Data for this study were obtained from the National Electronic Injury Surveillance System (NEISS). The NEISS has been described in detail previously.¹³ Briefly, the NEISS collects data on consumer product-related injuries treated at a representative sample of approximately 100 of the more than 5,000 US hospital EDs. Product-related injuries include illnesses only if a consumer product, sport, or recreational activity is associated with the onset of the illness. National estimates can be calculated from database records according to the sample weight assigned to each case based on the inverse probability of the hospital being selected for the NEISS sample.^{14,15} Since NEISS data are publicly available and de-identified, the study is exempt from institutional review board approval.

NEISS data for 2000-2021 were downloaded from the NEISS website at (<https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx>). All records with the letter groups “dod” and “bal” in the Narrative text field were identified and individually searched for those records that appeared to be dodgeball-related injuries. The resulting records that also included the body part code for a lower extremity (upper leg, knee, lower leg, ankle, foot, toe) in either the Body_Part or Body_

Continued on page 35

A study of dodgeball-related injuries treated at hospital emergency departments (EDs) found that an estimated 185,000 such injuries occurred in the US during 2001-2018.



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Table 1. Dodgeball-related injuries of the lower extremity treated in United States emergency departments by treatment time period, National Electronic Injury Surveillance System, 2000-2021

TREATMENT TIME PERIOD	NO.		EST.		
	NO.	%	NO.	%	95% CI
3-MONTH PERIOD					
December-February	370	26.0	12,814	26.5	9,587-16,042
March-May	430	30.3	15,458	31.9	11,721-19,195
June-August	252	17.7	8,628	17.8	6,244-11,011
September-November	369	26.0	11,488	23.7	8,523-14,454
DAY OF WEEK					
Sunday	99	7.0	3,234	6.7	2,058-4,410
Monday	180	12.7	6,312	13.0	4,424-8,200
Tuesday	200	14.1	6,835	14.1	4,832-8,837
Wednesday	268	18.9	8,564	17.7	6,194-10,934
Thursday	248	17.5	8,881	18.4	6,445-11,318
Friday	278	19.6	9,556	19.7	6,980-12,131
Saturday	148	10.4	5,007	10.3	3,411-6,602
TOTAL	1,421		48,389		38,989-57,789

No. = Number

Est. = Weighted estimate (sum of the Weight numeric field in the National Electronic Injury Surveillance System database). The numbers in the Weight field are not whole numbers but include decimals. As a result of rounding to whole numbers when performing analyses, the sum of the estimates for a given variable might not equal the total. The Consumer Product Safety Commission considers an estimate unstable and potentially unreliable when the number of records used is <20 or the estimate is <1,200.

95% CI = 95% confidence interval. Not calculated if the estimate is <1,200.

Part_2 numeric fields were included in the analysis. (It should be noted that the Body_Part_2 field was only added in 2019. Only two records included a body part code for a lower extremity in the Body_Part_2 field but not the Body_Part field.)

The variables examined were the treatment date (year, month, day of week), patient age and sex, incident location, patient disposition, diagnosis, and body part affected. The distribution of cases and national injury estimates were determined for the variables. National injury esti-

mates were calculated by summing the values in the Weight numeric field in the publicly available NEISS database, and 95% confidence intervals (CIs) were calculated for the estimates. The Consumer Product Safety Commission (CPSC) considers an estimate unstable and potentially unreliable when the number of records used is <20 or the estimate is <1,200.¹⁴ For those variable subgroups where the estimate was <1,200, 95% CIs were not calculated. Analyses were performed using Office Professional 2007 Access

and Excel (Microsoft Corporation, Redmond, Washington, US).

Results

A total of 1,421 dodgeball-related injuries of the lower extremity were identified during 2000-2021, resulting in a national estimate of 48,389 (95% CI 38,989-57,789) such injuries. (These represent 22.8% of the total estimated 212,616 dodgeball-related injuries of any body part.) The estimated annual number of injuries increased

Continued on page 36

from 821 during 2000 to 3,233 during 2010, fluctuated between 2,035 and 3,264 during 2011-2019, declined to 800 during 2020, then increased to 1,721 during 2021. Table 1 presents the distribution of dodgeball-related injuries of the lower extremity by three-month period and day of week. The lowest proportion of injuries was during June-August, increasing during each subsequent three-month period to the highest proportion during March-May. The lowest proportions of injuries were treated on Saturday and Sunday.

The highest proportion of estimated dodgeball-related injuries involved children age

13-19 years followed by children age 6-12 years; patients age 20 years and older accounted for 12.5% of the injuries (13.3% of the estimated injuries) (Table 2). The majority of patients were male (Table 2).

Over half of the dodgeball-related injuries of the lower extremity were a strain or sprain with the next most common types of injuries being a fracture and contusion or abrasion (Table 3). The most affected lower extremity body part was the ankle, followed by the knee and foot.

Roughly half of the estimated injuries (51.9%) occurred at school and an additional one-fifth (22.0%) at a place of recreation or

sports. Of the estimated injuries, the majority of patients (98.2%) were treated or examined at the hospital ED and released; only 1.5% were admitted for hospitalization.

Discussion

While the estimated annual number of dodgeball-related injuries of the lower extremity increased during 2000-2010, this trend did not continue. It is possible that the number of people playing dodgeball, and subsequently being injured, did not increase after 2010. The number of adults playing dodgeball was reported to have increased at least in the years immediately after

Table 2. Dodgeball-related injuries of the lower extremity treated in United States emergency departments by patient demographics, National Electronic Injury Surveillance System, 2000-2021.

VARIABLE	NO.		EST.		
	NO.	%	NO.	%	95% CI
PATIENT AGE (YEARS)					
0-5	9	0.6	71	0.1	-
6-12	625	44.0	19,093	39.5	14,677-23,509
13-19	609	42.9	22,805	47.1	17,716-27,895
20-29	72	5.1	2,324	4.8	1,379-3,270
30-39	59	4.2	2,183	4.5	1,274-3,092
40-49	31	2.2	1,123	2.3	-
50-59	13	0.9	677	1.4	-
60+	3	0.2	112	0.2	-
PATIENT SEX					
Male	950	66.9	31,966	66.1	25,279-38,652
Female	471	33.1	16,423	33.9	12,504-20,343
TOTAL	1,421		48,389		38,989-57,789

No. = Number

Est. = Weighted estimate (sum of the Weight numeric field in the National Electronic Injury Surveillance System database). The numbers in the Weight field are not whole numbers but include decimals. As a result of rounding to whole numbers when performing analyses, the sum of the estimates for a given variable might not equal the total. The Consumer Product Safety Commission considers an estimate unstable and potentially unreliable when the number of records used is <20 or the estimate is <1,200.

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Continued on page 39

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Table 3. Type of injury of dodgeball-related injuries of the lower extremity treated in United States emergency departments, National Electronic Injury Surveillance System, 2000-2021.

VARIABLE	NO.		EST.		
	NO.	%	NO.	%	95% CI
TYPE OF INJURY					
Strain or sprain	769	54.1	27,654	57.1	21,709-33,599
Fracture	271	19.1	8,510	17.6	6,151-10,869
Contusion or abrasion	150	10.6	4,753	9.8	3,216-6,291
Dislocation	58	4.1	1,818	3.8	1,006-2,629
Laceration	29	2.0	717	1.5	-
Avulsion	2	0.1	141	0.3	-
Hematoma	3	0.2	89	0.2	-
Other/not stated	146	10.3	4,888	10.1	3,319-6,456
BODY PART AFFECTED					
Ankle	571	40.2	20,059	41.5	15,466-24,651
Knee	399	28.1	13,366	27.6	10,031-16,701
Foot	210	14.8	8,412	17.4	6,074-10,750
Lower leg	137	9.6	3,430	7.1	2,206-4,653
Toe	79	5.6	2,807	5.8	1,737-3,876
Upper leg	33	2.3	703	1.5	-
TOTAL	1,421		48,389		38,989-57,789

No. = Number

Est. = Weighted estimate (sum of the Weight numeric field in the National Electronic Injury Surveillance System database). The numbers in the Weight field are not whole numbers but include decimals. As a result of rounding to whole numbers when performing analyses, the sum of the estimates for a given variable might not equal the total. The Consumer Product Safety Commission considers an estimate unstable and potentially unreliable when the number of records used is <20 or the estimate is <1,200.

95% CI = 95% confidence interval. Not calculated if the estimate is <1,200.

Records during 2019-2021 can have two coded diagnoses and affected body parts.

2010.⁶ However, concerns about whether playing dodgeball was appropriate in schools,^{1,2} and its banning in some US school districts,^{1,4,5} may have resulted in a decrease in the number of children playing dodgeball, and thus being injured.

The estimated number of dodgeball-related injuries of the lower extremity was 800 during

2020, a decline of 75% over the estimated number reported during 2019 (n=3,264) and the lowest annual estimate during the entire 22-year time period. This is likely the result of the COVID-19 pandemic, when, during at least the early part of the COVID-19 pandemic in 2020, many schools and other facilities were closed and

stay-at-home orders and social distancing were implemented.¹⁶ As a result, people, particularly children, had less opportunity to play dodgeball. In 2021, when many of the COVID-19 pandemic restrictions had been relaxed,¹⁶ the estimated annual number of dodgeball-related injuries

Continued on page 41

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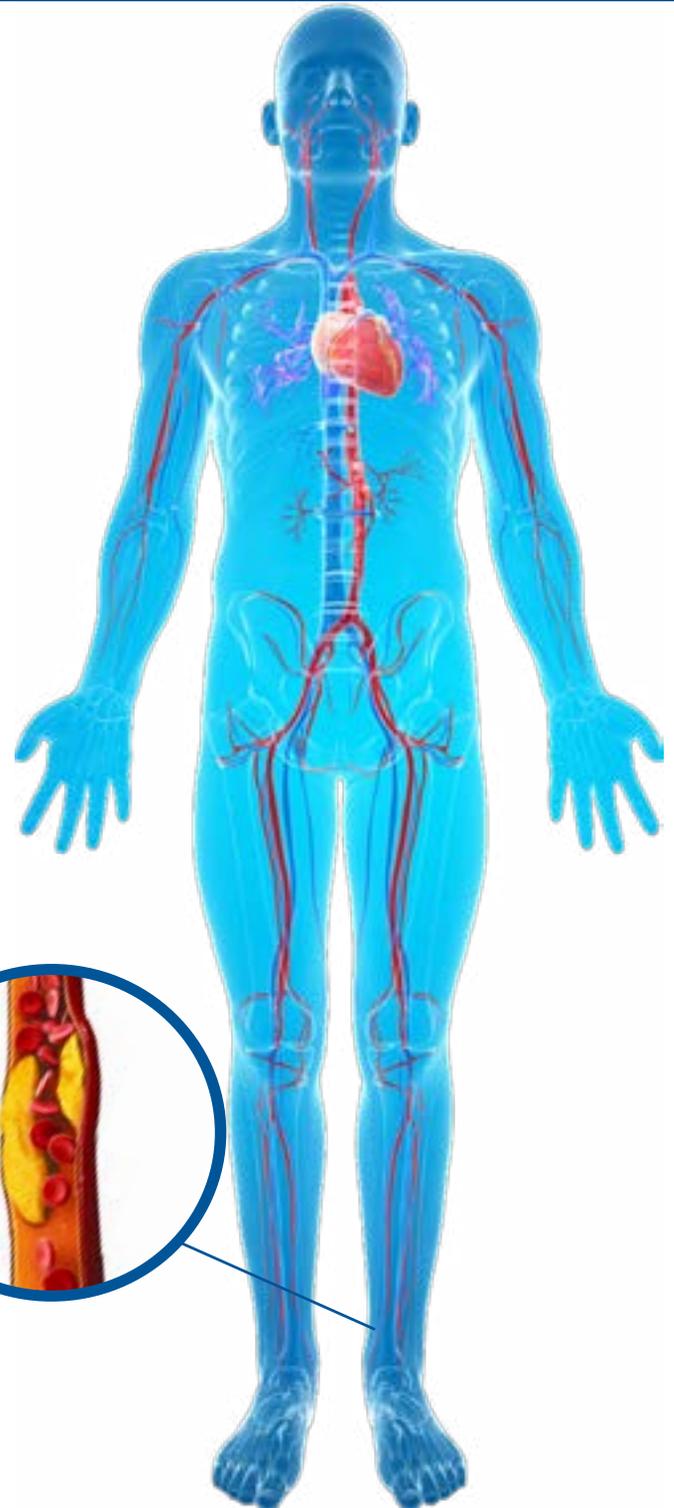
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of the lower extremity increased to 1,721. Still, excluding 2020, 2021 had the lowest estimated annual number of injuries since 2004 and was 47% lower than the estimated number of injuries during 2019.

Although not limited to any particular age group, the majority (87%) of injuries involved children age 6-19 years. Since this age group is school age and dodgeball is often played in school, it might be expected that many of the injuries occurred in school. This study found that school was the incident location for the highest proportion of such injuries. Furthermore, only 18% of the injuries were reported during June-August, when most US schools are not in session, and only 17% of the injuries were treated during the weekend.

The most common type of injury was a strain or sprain, accounting for over half of the reported injuries of the lower extremity, followed by a fracture and contusion or abrasion. These types of injuries might be considered relatively minor and not require hospitalization. This study found that 98% of the patients were treated or examined at the hospital ED and released.

There are limitations to this study. Cases were identified by searching for “dod” and “bal” in the Narrative field. Dodgeball-related injuries of the lower extremity where these terms were not documented in the Narrative field would not have been included in this investigation. This study only included those injuries treated at an ED. The number of dodgeball-related injuries of the lower extremity not seen at an ED is unknown. Investigation of such injuries from other data sources might provide a more complete view of these injuries.

In conclusion, the majority of dodgeball-related injuries of the lower extremity occurred among children age 6-19 years. After increasing during 2001-2006, the annual estimated number of injuries remained relatively stable until 2020. The most frequently reported injuries were a strain or sprain followed by fracture and contusion or abrasion. The majority of patients were treated or examined and released from the hospital ED. 

Mathias B. Forrester, BS, is an independent researcher in Austin, Texas. Now retired, he previously performed public health research for various university and government programs for 33 years.

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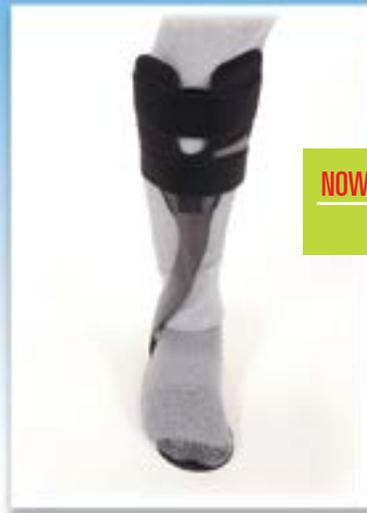


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Malnutrition: How It Affects Wound Healing in the Elderly

BY NANCY COLLINS, PHD, RDN, LD, NWCC, FAND, AND AME PROIETTI

Various screening tools can be used to identify malnutrition early in the wound care process, improving healing times and quality of life.

Anti-aging is not only a buzzword but a multimillion-dollar industry. Despite the many advertising claims and promises, we all experience physical and bodily changes as we age. As a person advances in years, the basic activities of daily living can become more difficult with food shopping, meal preparation, cooking, and clean up right on the top of the list. Rather than deal with all that is involved in preparing meals, many people rely on convenience and fast foods, which often are not the most nutritionally sound choices. In addition, problems with chewing, digestion, and appetite also can hinder eating. These situations may lead to compromised nutritional status, often simply referred to as malnutrition.

For people with wounds, malnutrition is a concern because it extends healing time, especially in the elderly. Malnutrition, which is generally understood to mean undernourished, can look different among patients and is often overlooked by wound care clinicians who are much more focused on topical treatments. That said, it is important to identify malnutrition as early as possible and understand the importance of referring compromised, elderly patients to a registered dietitian nutritionist (RDN) when needed.

The Risk Factors for Malnutrition

Risk factors for malnutrition include both physi-



ologic and social changes that occur as we age.

Common risk factors include:

- Poor oral and dental health
- Cognitive impairment
- Swallowing issues
- Digestion and bowel concerns
- Mobility and balance problems
- Polypharmacy
- Overly restrictive therapeutic diets
- Depression and loneliness
- Financial worries

Identifying Malnutrition

Wound care clinicians can assess malnutrition by using a validated screening tool. Many different screening tools are available for use in a variety of care settings. These tools typically involve asking a series of questions that the patient or family member can answer regarding

body weight, appetite or lack thereof, and typical meal intake. Completion of a nutritional screening takes only a few minutes and can provide insight into how well the patient may heal.

Beyond a screening, a nutrition-focused physical exam also can help identify malnutrition and provides the basis for an official diagnosis of malnutrition. A diagnosis of malnutrition usually requires patients to have 2 of the following 6 etiology-based criteria¹:

- Insufficient energy intake
- Weight loss
- Loss of muscle mass
- Loss of subcutaneous fat
- Localized or generalized fluid accumulation that may sometimes mask weight loss
- Diminished functional status as measured by handgrip strength

Perhaps the most obvious sign of a nutri-

Continued on page 44

tion issue is a significant amount of unintended weight loss. Clinically relevant weight loss trigger points are 5% weight loss in 1 month, 7.5% in 3 months, or 10% within 6 months. These values are considered significant regardless of starting weight. Overweight and obese patients may not appear as if they are malnourished, but it is important to look beyond scale weight and focus on body composition. The extra weight is metabolically inactive adipose tissue and may mask malnutrition.

The Importance of Proper Nutrient Intake

Many elderly patients experiencing malnutrition often do not consume enough calories in a day, which limits the total energy available. The body must have the ability to mobilize energy stores for repair and recovery from a wound or trauma. When inadequate energy is available, it is difficult to maintain baseline bodily functions and heal a wound at the same time. The body will prioritize maintaining key functions such as the heart and lungs, which means wounds will heal much more slowly.²

Eating less also can mean malnourished patients are not consuming enough protein. The recommended dietary allowance for protein is 0.8 grams (g)/kilogram (kg)/day for healthy adults. For comparison, the protein intake recommendation for adult patients with wounds is between 1.25 and 1.5g/kg/day.³ When elderly patients have a wound, they generally will need higher amounts of dietary protein for recovery because protein provides the nitrogen and amino acids that help build tissue and support immune responses. Without sufficient amounts of dietary protein, the body will not have enough resources to direct toward healing a wound.²

Malnourished patients also may lack key vitamins and minerals that play vital roles in immune defenses. When patients are deficient in vitamins such as vitamin A and vitamin C or minerals such as iron and zinc, their wound-healing time may become delayed because their immune system cannot respond as efficiently as it could in a well-nourished state.

Many elderly patients experiencing malnutrition often do not consume enough calories in a day, which limits the total energy available.

When to Refer Patients to an RDN

Patients can benefit from seeing an RDN if they are experiencing any signs or symptoms of malnutrition that are suspected of impeding wound healing. The difficulty often is that wound patients do not have access to a nutrition professional. Hospital-based wound clinics may be able to utilize the hospital dietitians. For outpatients, the Centers for Medicare & Medicaid Services and most insurance companies do cover some nutrition services, including diabetes self-management training. Acute care facilities can access an RDN simply by ordering a dietary consultation. In post-acute facilities, most patients are seen by an RDN as a matter of course.

RDNs have completed many levels of education and training established by the Commission on Dietetic Registration. In addition, most states require a professional license.

All RDNs must:

- Earn a 4-year degree, which includes a specially designed, accredited nutrition curriculum
- Complete an extensive supervised program of practice at a health care facility, food service organization, and/or community agency
- Pass a registration exam
- Maintain continuing education credits throughout their career

Approximately half of RDNs hold graduate degrees (soon new graduates will need a

minimum of a master's degree), and many have certifications in specialized fields, such as nutrition wound care. They can help establish a care plan that addresses problems such as unintended weight loss, changes in diet or eating habits, and chronic diseases.

The Bottom Line

If wounds are healing slower than expected, malnutrition is possibly the cause. Consulting a nutrition professional can help with complex issues and help move patients toward a more optimal nutritional status. 

Nancy Collins, PhD, RDN, LD, NWCC, FAND, is a wound care certified registered dietitian nutritionist based in Las Vegas, NV. Dr. Collins is well known for her expertise in the complex relationship between malnutrition, body composition, and tissue regeneration. To contact Dr. Collins, visit her website at www.drncollins.com.

Ame Proietti is a career-changing dietetic student at the University of Arizona. She plans to pursue her interest in nutrition communications.

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All Carbon Fiber Footwear Plates Are Not Alike

BY MATTHEW ARCIUOLO, C.PED. BOC

The evolution of carbon fiber plate technology has accelerated in the past few years becoming an integral part of high-end running shoes produced by many of the top brands. The Nike Vaporfly first debuted in 2017 and its popularity, along with its performance, prompted a new paradigm in running shoe technology. The Vaporfly series features a rocker-shaped carbon fiber plate embedded in the midsole (Figure 1) and it has revolutionized long-distance running – Eliud Kipchoge ran the first sub 2-hour marathon in 2019 wearing a prototype of the shoes. Since then, studies have shown that shoes with carbon fiber technology can improve run times by more than 4%.¹

Run times are important in other sports besides running, something that hit home once I started working with the U.S. Olympic Bobsled Team in 2005. When I started, both the athletes and coaches said that in bobsled, where the races are measured in the thousands of a second, the difference between a Gold medal and 10th place could be determined by as little as .02 of a second. The best place to gain an advantage, they said, is at the start or the 'push' phase of the race – the 50m sprint prior to jumping into the sled, which contributes an average of 9.6% to the entire lapsed time of the run. As a pedorthist, I realized that carbon fiber plate technology could be used to increase the downforce that our athletes could generate in that push phase. That's when I began to focus on how best to design what is today's VKTRY insole, which came onto the market in 2018.

A Bit of History

Flat spring plates were first used in footwear in the early 1900's for arch support. However, it was not until the Morton's extension footplate, conceived by Dudley Morton, MD, came on the scene in the 1930's that more rigid full-length insoles designed to limit the range of



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motion (ROM) of the 1st metatarsophalangeal (MTP) joint were used to any great extent for patients with turf toe and hallux limitus/rigidus (osteoarthritis of the big toe). These types of plates were used successfully for acute and chronic injuries to reduce forefoot and mid-foot stress while walking or running by reducing ROM and stabilizing the delicate structures of the foot. These rigid or semi-rigid plates were intended to limit the dorsiflexion ROM of the 1st MTP in order to relieve stress on the joint.

Then in 1998, Benno Nigg, PhD, and Darren Stefanyshun, PhD, researchers at the Human Performance Laboratory at the University of Calgary, studied the effects of midsole bending stiffness on jump height and joint loading. Nigg and his associates found an improvement in jump height, reduction of joint loading, and a reduction in energy loss in subjects using stiffer midsoles.²

Up until the Nike Vaporfly's introduction, shoe insoles for athletic footwear had been pas-

sive devices, designed to attenuate shock and redistribute pressure. In whatever application, these passive insoles receive energy (force) from the user and redistribute it to areas of lower pressure. Traditional insoles are also designed to provide cushioning and support to alleviate a variety of issues such as plantar fasciitis, Achilles' tendinitis, shin splints, and to some degree or another, align the foot, ankle, and knee into a more biomechanically advantageous position.

However, over the last 20 years, advances in materials technology have made the concept of dynamic insole technology not only possible but practical. Today's athletes – from elite level to weekend warriors – are demanding more out of their gear, no matter what sport.

Carbon Fiber, Meet the Reverse Ellipse Spring Plate

Carbon fiber is 5-times stronger than steel and twice as stiff. Though carbon fiber is stronger

Continued on page 49



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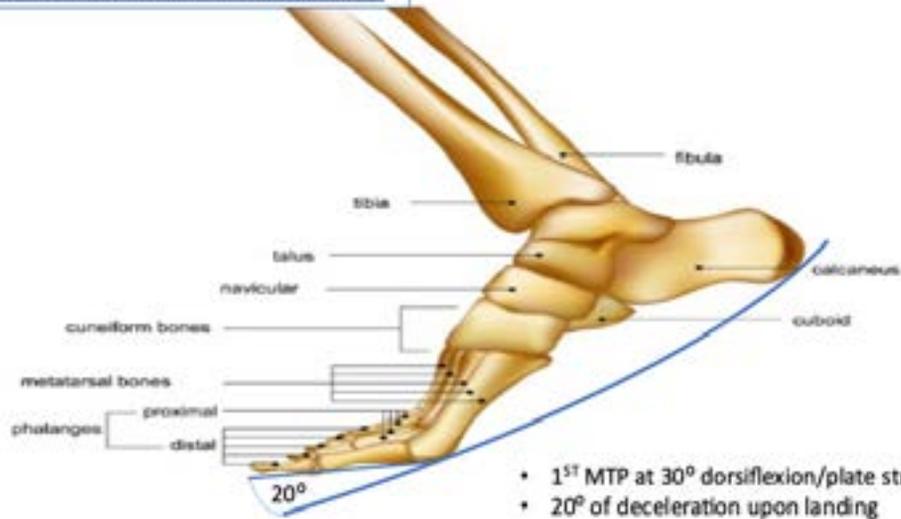


Figure 1

- 1ST MTP at 30° dorsiflexion/plate strained to 20°
- 20° of deceleration upon landing

VKTRY REVERSE ELLIPSE PLATE DESIGN

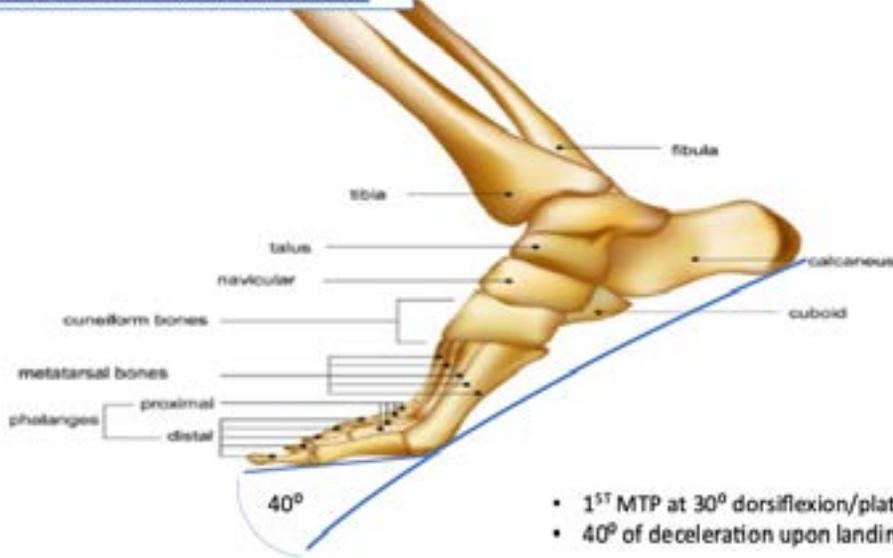


Figure 2

- 1ST MTP at 30° dorsiflexion/plate strained to 40°
- 40° of deceleration upon landing

FLAT PLATE

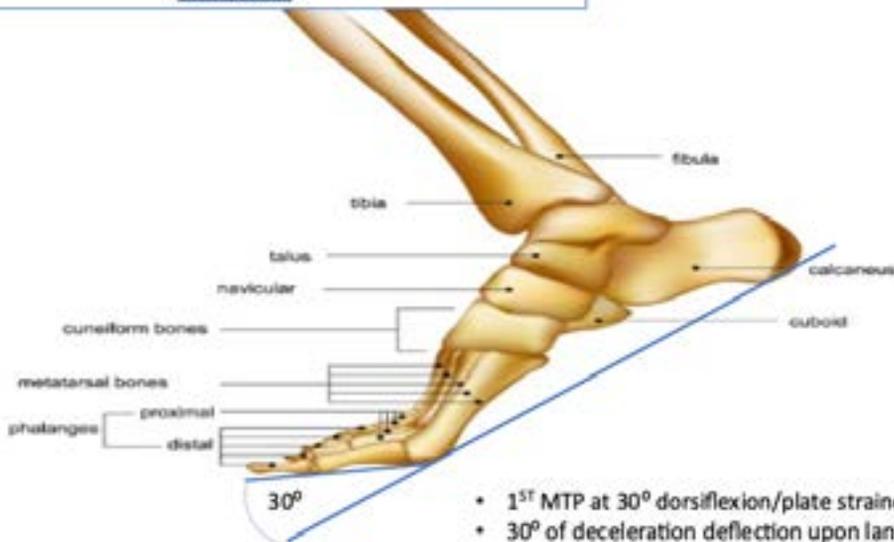


Figure 3

- 1ST MTP at 30° dorsiflexion/plate strained to 30°
- 30° of deceleration deflection upon landing

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and stiffer than steel, it is lighter than steel, making it the ideal manufacturing material for a variety of products. The use of carbon fiber in footwear is a relatively new technology designed to stabilize the ultra-soft and flexible structure of high-end running shoes. Running shoes such as the Nike Vaporfly NEXT%, among others, affirmed the concept that carbon fiber could be beneficial for athletes across sports.

What sets VKTRY carbon fiber insoles (VKs) apart from standard insoles is the concept of a reverse ellipse spring plate design (Figure 2). Insoles of all types are generally made of foam, plastic or rubber and are designed to support, stabilize, and or cushion the foot. They are mainly passive devices designed to absorb the input forces generated by the human body and disperse them. The limitations of this passive concept of insoles are that the forces generated naturally by movement in any direction are not utilized efficiently and any extra required energy must come from the muscles of the lower limbs. These muscles are already handling the full weight and inertia of the athlete. The problem with traditional insoles is that the forces that the

human body naturally produces – such as the force downward (load) and the force forward (momentum) – are wasted and not returned to the user. The paradigm of dynamic, rather than passive insoles is the concept behind the VKTRY technology. VKs store the energy that an athlete generates in both the forward and the downward direction, and instead of simply absorbing the energy, they store and then return that energy directly to the athlete. VKs do not add any extra energy, like a spring or motor, but rather take the energy that would ordinarily be wasted and returns it, resulting in improved

Field research with 263 athletes at 4 Division I universities showed a 41% reduction in toe injuries and a 22% reduction in lower leg injuries compared to the 3 years prior.

performance and more explosive starts.

This increased propulsion results in increased stride length and reduced ground contact time resulting in less steps per mile and reduced fatigue. Studies at Southern Connecticut State University (SCSU) have shown an increase of an average 1.6” in the vertical jump, 4” in the broad jump and up to .4 sec faster in the 40-yard dash.³

Field research with 263 athletes at 4 Division I universities showed a 41% reduction in toe injuries and a 22% reduction in lower leg injuries compared to the 3 years prior.⁴

Independent clinical research from the Korey Stringer Institute at the University of Connecticut led by Douglas Casa, PhD, found that VKTRY insoles provided significantly greater stabilization of the knee, ankle, and foot – all factors that lead to a lower risk of lower leg injury.⁴ The athletes using VKs also showed reduced joint loading upon landing.

VKTRY insoles are designed with carbon fiber to store, focus, and release the energy generated by the human body during normal walking, running, or jumping movements. This force, which would normally be distributed among the 3 planes of motion, is focused

Continued on page 52

sagittally – directing force downward – in the plane most beneficial to the athlete in line with Newton’s third law of motion: for every action in nature there is an equal and opposite reaction). Or, more technically: $F_A = -F_B$ – wherein one object (A) exerts a force (F_A) on a second object (B), then B simultaneously exerts a force (F_B) on A, and the 2 forces are equal in magnitude and opposite in direction: $F_A = -F_B$.

VKs return an “impulse” to the user, called a “moment” in biomechanics. The magnitude of this is difficult to define because there are many factors that contribute to that measurement, such as tendon/ligament integrity, muscle fast/slow twitch composition as well as technique, which can all skew the data. This moment is similar to one frame in a video... essentially a snapshot in time. As a result of storing potential energy and releasing kinetic energy at the metatarsals and consequently at the ankle mortise, VKs increase the rate, force, and amount of plantarflexion.

Carbon fiber is 5-times stronger than steel and twice as stiff. Though carbon fiber is stronger and stiffer than steel, it is lighter than steel, making it the ideal manufacturing material for a variety of products.

Regarding performance, research at SCSU Human Performance Laboratory showed an average of 9.3% increase in rate of force development (explosiveness) and an 8.1% increase in ground force (GRF).³

VKTRY offers 5 different Pro Levels, essentially flexibility levels, determined by our proprietary algorithm and based on the user’s weight, shoe size, sport, age, and gender. A

300lb offensive lineman with a size 15 foot is going to need a stiffer Pro Level than a 100 lb. tennis player with a size 6 foot. This Pro Level system assures the user, no matter what size, the proper VK for optimal performance.

Design Specifics: How It Works

One of the VK’s most important design features is its reverse ellipse configuration. The leaf spring concept has been used for over a century because it is not only efficient in absorbing – but also returning energy. However, when that ellipse is inverted, as in the VK design, instead of the load points being at both ends, the load point is in the center of the beam with the posterior and distal aspects of the plate absorbing the energy.

Unlike a leaf spring however, the reverse ellipse design is not only acted upon by a load sagittally, but also the spring is deformed at the metatarsals during dorsiflexion. This combination of deflection at the center of the

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plate along with deflection at the metatarsals provides a significant amount of potential energy storage and transitively an increase in kinetic energy return.

Anatomically, the human foot has an acceptable ROM at the metatarsals of -30° (plantarflexion) to $+80^\circ$ (dorsiflexion) after which point the muscles, tendons, and ligaments are placed at a mechanical disadvantage to efficiently move the joint. It is at this point when the foot is most vulnerable to injury. These values are largely dependent on many factors such as ligament and tendon integrity, posterior chain strength/flexibility, and others including plantar fascia and spring ligament attachments.

The available range of 1st MTP joint dorsiflexion largely depends on the position of the 1st ray, but as we approach the limits of acceptable ROM, the joints are placed at a mechanical disadvantage.

Let's take for example an individual whose foot is dorsiflexing to 30 degrees while run-

In engineering, material deflection is the degree to which a structural element is displaced under a load and the materials response to this load.

ning (Figure 1). When the joint is bent to 30 degrees, a flat plate is strained to 30 degrees, thereby storing 30 degrees of potential energy.

In current running shoes using carbon fiber tech, the carbon plates are rocker-shaped and assume a 10-degree upward rocker at the toe. When the 1st MTP is dorsiflexed to 30 degrees, the plate is only strained to 20° and therefore can only store that much energy (Figure 2).

The VKTRY insole design places the foot on a plane whereby the 1st MTP is superior to the Hallux unweighted, therefore it's ROM starts, not at 0° but at -10° . This gives the 1st MTP a mechanical advantage in that the VK is already storing 10° of potential energy when the 1st MTP is at 0 compared to a flat plane insole, which cannot store energy if is not strained.

With the VK's unique contour, when the 1st MTP is at a dorsiflexed angle of 30 degrees, the VK is strained to 40° as a result of its slope, storing an extra 10 degrees of potential energy before the 1st met has even begun its travel (Figure 3).

In engineering, material deflection is the degree to which a structural element is displaced under a load and the materials response to this load. The deflection distance of a member under a load can be calculated by integrating the function that mathematically describes the slope of the deflected shape of

Continued on page 55

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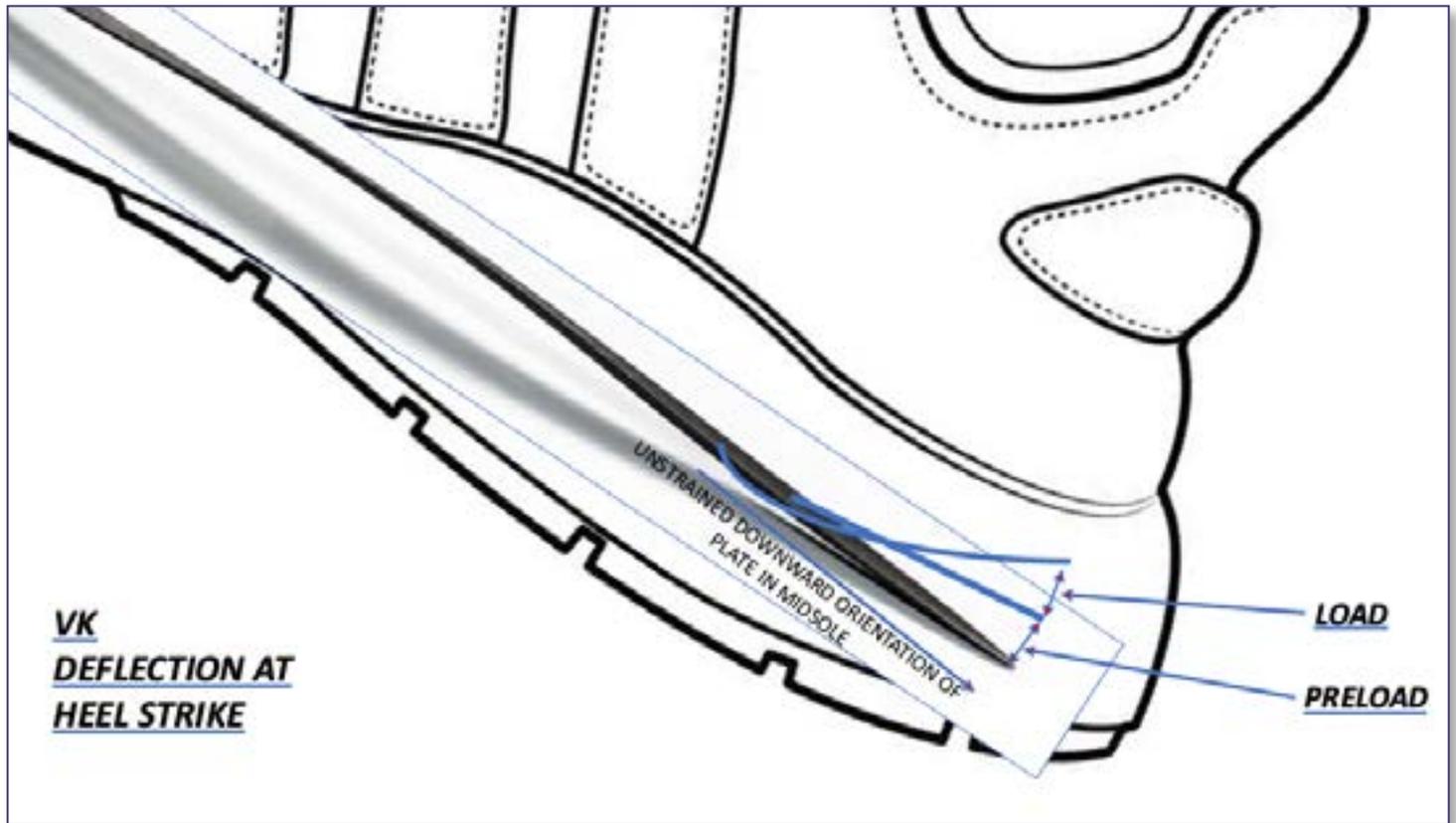


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the member under that load. In the case of the above example, the slope of the flat plane is 0° whereas the slope of the VK is 10° and the slope of the rocker plate is -10° .

A flat plate is an example of a homogeneous beam deflecting at the same rate at any point, depending on the location of the load and its supports. Because of the Pro Level (tiered) design of the VK, the deflection (f) is non-homogenous, meaning that the deflection at the metatarsals is always less than the deflection angle distally because as the layers of carbon fiber decrease distally, deflection will be greater mirroring the MTP, IP, and DIP joints. In all Pro Levels, the VK has the most layers directly inferior and posterior to the metatarsal heads and as it proceeds distally, the layers decrease in a step-down fashion thus becoming more flexible distally. The VK's slope is not constant but rather a non-linear deflection. This distinction is important in that the human foot is not a linear, rigid structure. VKs are designed to biomechanically compliment the structure of the foot by employing these varying Pro Levels in its design; stronger where the

foot is stronger, and more forgiving where the foot is more delicate.

Conversely, the very characteristics that make the VK an effective lever for the foot during propulsion also serve to decelerate the athlete upon landing. Because VKs afford extra degrees of dorsiflexion energy storage, they also give the athlete an extra measure of deflection upon landing at the heel and toe, similar to landing on a diving board. This added ROM of plate deflection during concentric movements also allows efficient and softer deceleration upon landing.

The march of technology, in virtually any field cannot be stopped, especially when the results are a benefit to the end user of the technology. VKTRY Performance Insole technology represents a quantum leap in that inevitable progress. 

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HANGER, INC. TO BE ACQUIRED BY HEALTHCARE INVESTMENT FIRM

Hanger, Inc., a provider of orthotic and prosthetic (O&P) patient care services and solutions, announced that it has entered into a

definitive agreement to be acquired by Patient Square Capital, a dedicated healthcare investment firm. Under the terms of the agreement, which has been unanimously approved by Hanger's board of directors, Hanger stockholders will receive \$18.75 in cash per share, representing an approximately 29% premium to the 30-calendar day volume-weighted average price ending July 20, 2022, and a total enterprise value of approximately \$1.25 billion. Upon completion of the transaction, Hanger will become a privately held company, and its common stock will no longer be traded on the New York Stock Exchange.

The transaction will be financed through a combination of committed equity financing provided by Patient Square Equity Partners, as well as committed debt financing to be led by funds managed by Ares Capital Management. The transaction is expected to close in the fourth quarter of 2022, subject to the receipt of stockholder approval, regulatory approvals, and the satisfaction of other customary closing conditions. Following the close of the transaction, Hanger will continue to be led by Vinit Asar, who has been its president and CEO for over a decade, and will maintain its headquarters in Austin, Texas.

Patient Square Capital is a patient-centered investment firm with a team of seasoned executives that uses healthcare expertise, a broad network of relationships, and a partnership approach to make investments in companies to grow and thrive, partnering with organizations that they believe can improve patient lives, strengthen communities, and create a healthier world.

POST-OPERATIVE KNEE BRACE ATTACHMENT

OrthoLift, a new, FDA-listed product, is designed to assist patients with post-operative knee brace alignment. The device is a handle attachment for the knee brace and is easy to use. It allows the patient to keep their knee



brace in proper alignment while standing in a vertical position or while walking. The handle also provides an additional grip to assist the patient with the repositioning of their leg from a seated to a laying position in a safe and comfortable manner. The OrthoLift fits all major US post-operative, hinged knee braces and is easily installed in 3 simple steps. With OrthoLift, a patient can more easily follow doctor's orders for exercise and care when their brace fits comfortably and stays in place.

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MICROFLUIDIC-BASED ROBOTIC PROSTHESIS LOWERS SOCKET PRESSURE

Canadian scientists have developed a new type of prosthesis using microfluidics-enabled soft robotics, which promises to greatly reduce skin ulcerations and pain in patients who have had a transtibial amputation.

The scientists started with a recently developed device using pneumatic actuators to adjust the pressure of the prosthetic socket. They also developed a way to miniaturize the actuators by designing a microfluidic chip with 10 integrated pneumatic valves to control each actuator. The full system is controlled by a miniature air pump and 2 solenoid valves that

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provide air to the microfluidic chip. The control box is small and light enough to be worn as part of the prosthesis.

“Rather than creating a new type of prosthetic socket, the typical silicon/fabric limb liner is replaced with a single layer of liner with integrated soft fluidic actuators as an interfacing layer,” said Carolyn Ren, PhD, from the University of Waterloo, Ontario, Canada, who was part of the team that developed the device.



Proof-of-concept rendering (left) and photo (right) of the prototype of the new microfluidics-enabled soft robotic prosthesis for lower limb amputees. Image courtesy of Waterloo Microfluidics Laboratory at University of Waterloo.

Medical personnel with extensive experience in prosthetic devices were part of the team and provided a detailed map of desired pressures for the prosthetic socket. The group carried out extensive measurements of the contact pressure provided by each actuator and compared these to the desired pressure for a working prosthesis. All 10 actuators were found to produce pressures in the desired range, suggesting the device will work well in the field. Future research will test the approach on a more accurate biological model. The group plans additional research to integrate pressure sensors directly into the prosthetic liner.

FES CYCLING THERAPY

MYOLYN has received 510(k) clearance from the US Food and Drug Administration on a new, second version of its flagship product, the MyoCycle. With 4 new models, the MyoCycle brings functional electrical stimulation (FES)



cycling therapy to at-home and clinical-setting users. The new models—Home, Home Plus, Pro, and Pro Plus—offer advanced technologies to better meet patient needs, such as additional stimulation channels, new walking and cycling modes, additional muscle group targeting options for core and lower leg muscles, new FDA-cleared benefit of muscle re-education, real-time performance feedback, and more adjustable stimulation parameters. With new muscle group targeting of the core and lower legs, in addition to the thighs and glutes, the MyoCycle can benefit those who face a variety of medical conditions resulting in lower-body paralysis or muscle weakness, including spinal cord injuries, stroke, multiple sclerosis, brain injury, Parkinson’s disease, cerebral palsy, foot drop, and general orthopedic rehabilitation.

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FM SPORT CUSTOM ORTHOTIC



Forward Motion Medical has released its new FM Sport custom orthotic. This new device has been designed to boost performance and

provide support needed by active patients. The FM Sport boasts high-grade materials such as PRX graphite shells and breathable, shock-absorbing perforated Ucolite. The ultra-thin and ultra-strong semi-rigid PRX graphite shells are available in 3 rigidities and have a lifetime warranty against breaks and cracks. Other standard accommodations include a first ray cut out to promote motion in the first ray, modified intrinsic posting, and a 12mm heel cup to provide stability. (All accommodations can be altered to fit the needs of the patient at no extra charge.) The low-profile design fits easily into performance footwear such as running shoes, basketball shoes, and cleats, allowing doctors to accommodate a wide range of active patients.

Forward Motion Medical

800/301-5835
www.fdmotion.com

METEOR/METEOR MINI ACCESSORY BUNDLE



MyoStorm has introduced an Accessory Bundle for use with its Meteor and Meteor Mini massage balls. The Accessory Bundle includes a 3-in-1 Recovery Roller, a Dual Layer Recovery Mat, and a Massage and Stretch Strap. The Recovery Roller turns the massage ball into a vibrating foam roller or use half of the roller for a spinal stretch or to warm up large muscle areas as well as roll out more tender spots that might not be ready for the trigger-point therapy of the Meteor Mini. The Recovery Mat

NEW & NOTEWORTHY

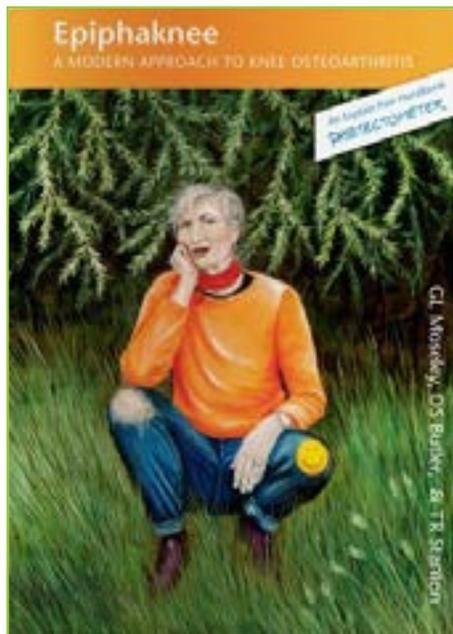
is designed to maintain therapeutic vibration to your body, but diffuse sound. The Massage and Stretch Strap helps target out-of-reach muscle knots and trigger points with the massage ball. It can also be used for stretching out tight muscles such as hamstrings, calves, and quads. Accessories are also sold individually. The Meteor or Meteor Mini is not included.

MyoStorm

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myostorm.com

NEW KNEE OSTEOARTHRITIS BOOK FROM NOIGROUP



Epiphaknee: A Modern Approach to Knee Osteoarthritis is a new book written by 3 internationally renowned pain and movement experts: G. Lorimer Moseley, DSc, PhD, FAAHMS, FPMANZCA, FACP; David Butler, Ed D, BPhy, GDAMT, M App Sc, PT; and Tasha R. Stanton, BScPT, MSc, PhD. Based on recent scientific research, this empowering book reveals the underlying factors that contribute to knee osteoarthritis (OA) and provides guidance on treatment and recovery (including the 3 critical ingredients to recovery), the groundbreaking Protectometer tool, and how to design an exer-

cise and management program. Discover a new approach to thinking about and treating knee OA with this book which serves as a personal guide for individuals with painful knee OA and is an indispensable resource for practitioners who treat them.

OPTP

800/367.7393

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ACSM ANNOUNCES NEW OPEN ACCESS JOURNAL: EXERCISE, SPORT, AND MOVEMENT

Wolters Kluwer is further expanding its publishing partnership with the American College of Sports Medicine (ACSM), with the addition of *Exercise, Sport, and Movement (ESM)*. Gary Liguori, PhD, FACSM, is the inaugural editor-in-chief of the new journal. He is dean of the College of Health Sciences and Professor of Kinesiology at the University of Rhode Island, Kingston, and a longtime contributor to ACSM education and publishing projects.

ESM will be an international, open access, peer-reviewed journal focusing on all aspects of exercise science and sports medicine. It will present new reports on scientific, clinical, public health, community, and policy topics. The



journal will run on a continuous publication model, with articles posted online as soon as they are ready. The first issue is slated for this fall. Papers will then be compiled into quarterly compendia, the first of which is scheduled for January 2023.

Liguori and the editorial team encourage manuscripts addressing movement, fitness, exercise, physical activity, health promotion, sport, and prevention and treatment of injury and disease. Manuscripts can be submitted at www.editorialmanager.com/esam/.

For link to future updates, visit www.acsm.org/education-resources/journals/exercise-sport-and-movement.

SOFTWARE FOR HUMAN BODY 3D ACQUISITION, MEASUREMENT



TechMed 3D has released its new SNAP solution, a fully mobile and automatic software for human body 3D acquisition and measurement. Users can scan, visualize, and obtain measurements for plantar surface (this tool only targets insoles for the moment). Once processed they can export their files directly from their iPhone in 1 simple step. The new technology will make custom insoles possible with just 2 scanning modes: plantar surface and foam boxes, allowing for more data in a single scan within seconds. TechMed 3D has also integrated other accurate features, which will save users time with minimal input by enabling automatic measurements and file reconstruction directly on the iPhone; the file is

reconstructed automatically on the device and basic automatic measurements can be easily obtained. Users can also purchase their scans directly from the app.

TechMed 3D
855/832-4633
techmed3d.com

STUDY FINDS SURPRISING WAY TO MAKE WALKING EASIER

Findings by researchers at the University of Nebraska at Omaha (UNO) describe a novel way to reduce the energy people spend to walk, as much as by half, which could have applications for therapy received by patients with impaired walking abilities. This research shows that a strategically timed pull from a waist belt connected to a pulley can help an individual use less energy for each step while walking. However, the optimal timing of that forward pull was what came as a surprise.

“When we walk, there is a short period between steps where one foot is stopping its forward motion while the other is preparing to accelerate to take the next step forward,” said Philippe Malcolm, PhD, an assistant professor in biomechanics at UNO. “Our research shows that this brief window where both feet are on the ground is the best time to apply force to assist walking most efficiently.”



Based on previous literature, the researchers believed they would see the highest energy savings by pulling when the individual is trying to propel forward against the ground. However, they found the best time to apply force is when both feet are on the ground.

The device works by providing timed pulls from a motorized pulley while an individual walks on a treadmill. Since it only requires wearing a waist belt, it is relatively easy to make individualized adjustments compared to more complicated devices. The findings about optimal timing could have applications for exercise therapists in clinical settings providing care for patients with conditions such as peripheral artery disease.

AR HEADSET FOR ORTHOPEDIC SURGEONS



Enovis has launched ARVIS® (Augmented Reality Visualization and Information System), a proprietary, real-time, hands-free augmented reality (AR) headset designed for orthopedic surgeons, so they can visualize precision guidance when performing hip and knee surgery with the support of AR. Unlike other traditional robotic systems that require additional staff, ARVIS is a self-contained, wearable surgical guidance device controlled by the surgeon that can either be worn on the accompanying headband, or it is compatible with the helmets already worn in surgery. The technology is designed to ensure surgeons can focus on their patient, not a screen across the room. ARVIS is more sustainable and environmentally friendly than other technologies as well, due to the elimination of single-use plastic instruments and consumables requiring disposal. It is AR-supported surgery, through the eyes of the surgeon.

Enovis
302/252-9160
enovis.com

LAB-MADE CARTILAGE GEL OUTPERFORMS THE REAL THING

A Duke University-led team said they have created the first gel-based cartilage substitute that is even stronger and more durable than the real thing. Mechanical testing reveals that the team's hydrogel—a material made of water-absorbing polymers—can be pressed and pulled with more force than natural cartilage and is 3-times more resistant to wear and tear. Implants made of the material are currently being developed by Sparta Biomedical and tested in sheep. Researchers are gearing up to begin clinical trials in humans next year.

To make this material, the team took thin sheets of cellulose fibers and infused them with a polymer called polyvinyl alcohol—a viscous goo consisting of stringy chains of repeating molecules—to form a gel. The cellulose fibers act like the collagen fibers in natural cartilage, giving the gel strength when stretched. The polyvinyl alcohol helps it return to its original shape. The result is a Jello-like material, 60% water, which is supple yet surprisingly strong.

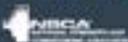
Natural cartilage can withstand 5,800 to 8,500 pounds per inch of tugging and squishing, respectively, before reaching its breaking point. This lab-made version is the first hydrogel that can handle even more. It is 26% stronger than natural cartilage in tension, something like suspending 7 grand pianos from a key ring, and 66% stronger in compression, which would be like parking a car on a postage stamp.

Their method of attachment involves cementing and clamping the hydrogel to a titanium base. This is then pressed and anchored into a hole where the damaged cartilage used to be. Tests show the design stays fastened 68% more firmly than natural cartilage on bone.

DO YOU HAVE A NEW PRODUCT OR NEWS?

We want to hear about your new product, news, or innovation! We want to hear from you! Please send information to Laura@LERmagazine.com

EFFECTS OF MUSIC ON RESISTANCE EXERCISE PERFORMANCE

Reference : Grgic SCJ 2021 

Designed by @YLMsPortScience

1 The effects of pre-exercise fast tempo music on performance compared with slow tempo music set to induce relaxation and no-music control are variable and difficult to quantify precisely



2



Nevertheless, it seems that pre-exercise music does not hinder subsequent activity and, depending on the individual, can provide small to substantial improvements in exercise performance

3



Compared with no-music control or non-preferred music during exercise has been reported to enhance muscle endurance, handgrip strength, velocity, and power

4

Currently available data indicate that individuals interested in the ergogenic effects of music should select fast tempo music (>120 bpm) with the music volume set from 70 to 80 decibels

>120 BPM

70-80 DB



5



Using individual preference regarding music genre seems to produce the most consistent performance-enhancing effect

6

Lyrical content, harmony, and melody are also factors that may determine the ergogenic potential of music



7



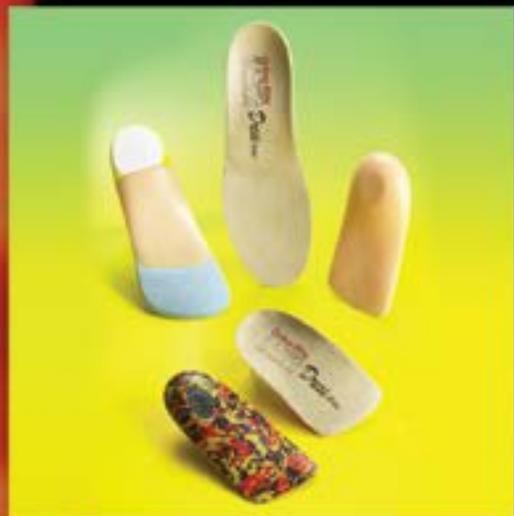
By using some of the recommendations outlined herein, individuals may harness and optimize the ergogenic effects of music on resistance exercise performance

Source: Grgic, J. Effects of music on resistance exercise performance: a narrative review. Strength and Conditioning Journal. 2022;44(4):77-84
doi: 10.1519/SSC.0000000000000682

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