

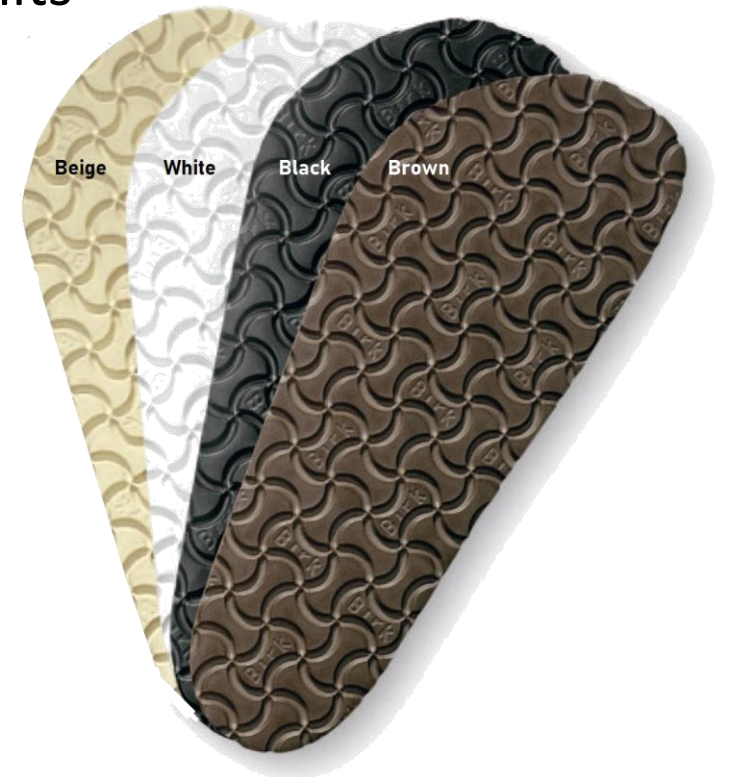
Sole Modifications

In this session...

- Materials
- Commonly used sole modifications
- Indications and usage recommendations
- Insurance coverage concerns

Materials used for sole modifications

- Outsole materials
 - Available in sheet stock
 - Available from OEM in diecut or premolded outsole units



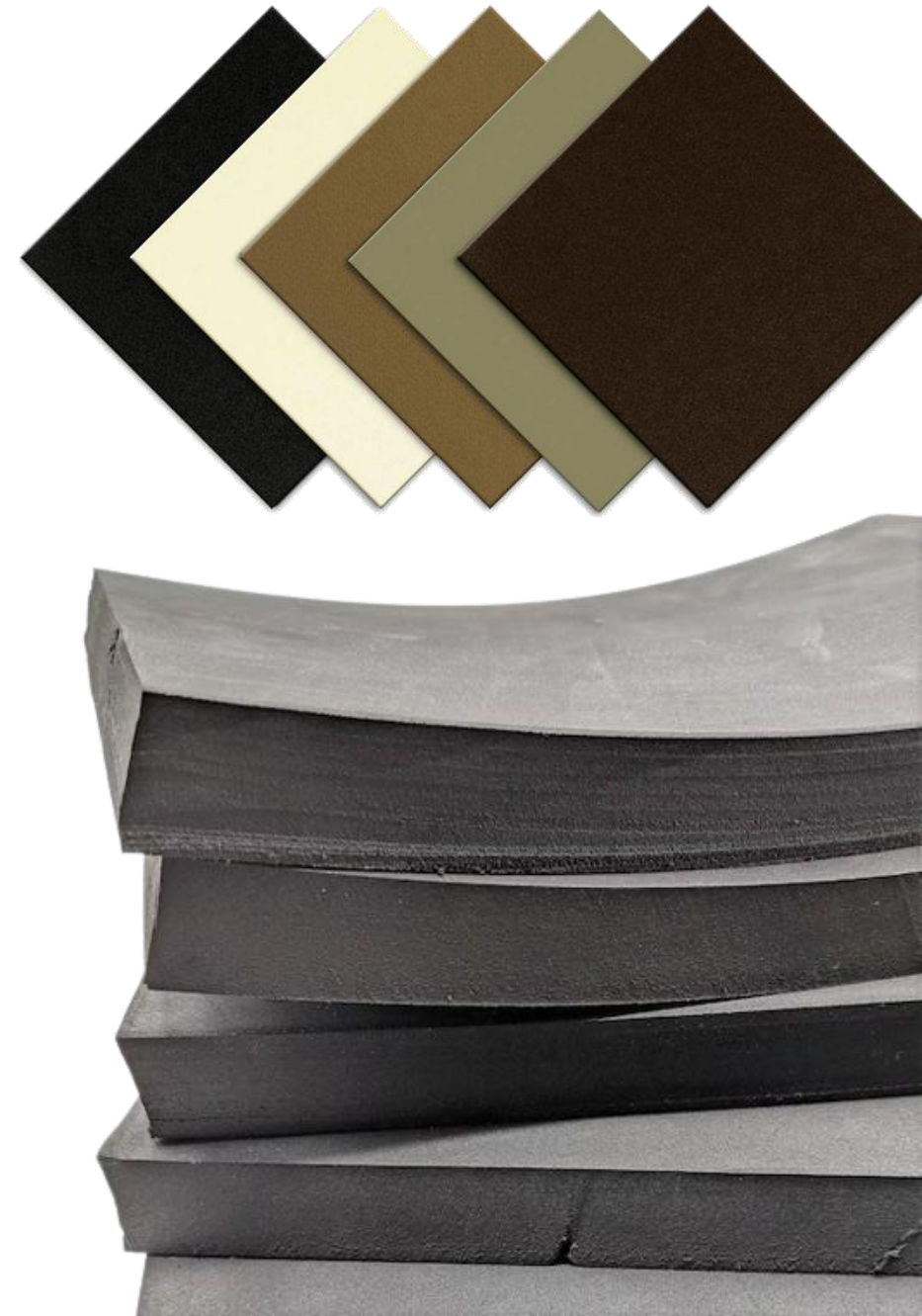
Ousole Materials

- EVA
- Polyurethane
- Rubber
 - Crepe – a type of crude natural rubber sole characterized by a crinkled texture like crepe paper. Cushiony, but not durable.
 - Topy – thin rubber outsole attached to leather outsole.
- Composites
- Leather



Shoe Modification Materials

- Ethylene vinyl acetate (EVA)
 - Available in many colors and densities
 - Soletech Cloud
- Neoprene
 - Firmer and more durable than EVA
 - Also, heavier than EVA
- Styrene-butadiene rubber (SBR)
- Blends
 - SolFlex Firm Crepe™ - 50-55 Shore A durometer EVA/SBR blend



Contact Adhesives

- Masters
- Barge
- Renia
- Jet Set
- Cyanoacrylate glues
- Some glues are heat-activated
- Thinners, primers and accelerants are frequently needed, as well



Rocker Soles

Rocker soles are covered quite thoroughly in the aptly named “Rocker Soles” module.

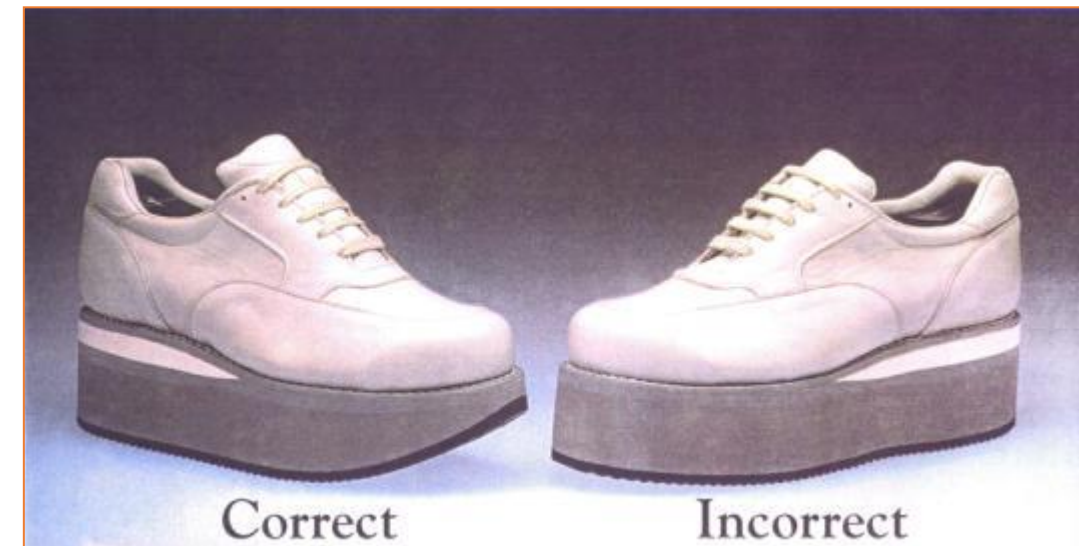
Extended Shank

- Can be steel, carbon composite or nylon
- Shank is embedded in a channel in the midsole
- Carbon and nylon shanks come pre-contoured. The steel shanks may need to be trimmed to length and will need to be contoured.
- Shank is used to stiffen sole to significantly reduce bending forces through the midfoot and forefoot.
- Often requires at least a mild rocker sole to compensate for the intentional loss of motion created by the extended shank.
- Conditions treated
 - Hallus limitus/rigidus
 - Midfoot OA/DJD
 - Forefoot ulcers
 - Sesamoiditis
 - Turf toe
 - Flexor tenosynovitis in toes
 - Charcot arthropathy
 - s/p Partial foot amputation



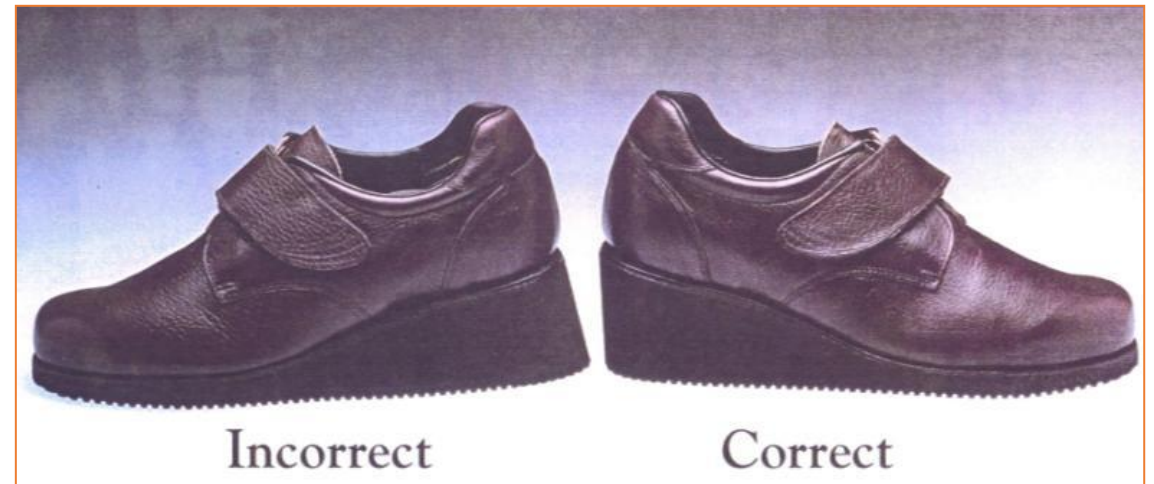
Heel-and-Sole Extension

- Also called *build-up*, *sole lift*, or *elevation*.
- Adds weight to shoe. For substantial elevations, consider hollowing out core of build-up as opposed to using lighter, softer materials that will compress more rapidly.
- Need to incorporate toe rocker and, ideally, some heel rocker.
- Better than heel lift as it keeps ankle in a more functional, neutral position as opposed to forcing it into plantarflexion and necessarily loading the forefoot as a heel lift will do.
- Indications:
 - Limb length discrepancy
 - Typically, correct $\frac{1}{2}$ to $\frac{3}{4}$ of discrepancy amount if it is a longstanding discrepancy. Amount should be determined by referring physician.
 - Foot drop
 - Applied to opposite foot to allow for swing through without toe drag on the affected side



Heel Lift

- Internal (removable) or external
- Indications
 - Equinus deformity
 - Acquired
 - Congenital
 - Chronic Achilles tendinitis
- Not recommended for limb length discrepancy without equinus contracture as long-term use will promote Achilles contracture!
- If heel lift is required, make sure it is added without backflare



Flares Vs. Wedges

- Wedges
 - Used to help correct passively *correctable deformities*
 - Applied either medially or laterally
- Flares
 - Used to provide stabilization for unstable or *fixed deformities*
 - Provides wider base of support
 - May be applied medially, laterally or both.



Lateral Flare

Lateral Wedge

Wedges

- May be applied to the heel, forefoot or full length
- Medially or laterally
- Indications:
 - Correct correctable deformity
 - Accommodate fixed deformities
 - Relieve pressure, strain, or pain caused by dynamic biomechanical deviation such as hyperpronation or peroneal tendinitis in a cavovarus foot.
 - Improve foot and ankle alignment during gait to normalize overall LE mechanics



Flares

- Think of a flare as an outrigger or a kickstand.



Factory Flares



Flares – What Are They Good For?

- Provide a wider base of support.
 - Balance issues (may be contraindicated for those with proprioception issues)
- Combat hyper-pronation or hyper-supination
 - Cavovarus foot with lateral ankle instability
 - Peroneal tendinitis
- General improvement of ankle/hindfoot instability



Flares - Considerations

- What are you trying to accomplish?
- What kind of shoes are they asking to be modified?
- Heel Vs. Full length
- Flare plus a wedge?
- ~~If it works,~~ When it works, they'll probably need multiple shoes done

Flares – Tips for Success

- Fabricate using firm, durable material
- Dual density midsoles can work with you or against you
- Cover underside of flare with soling material/incorporate it
- Shape it as much as possible before adhering to the shoe



Flares – What Not to Do

- Don't use low durometer EVA to make your flare
- Consider *not* adding a flare to a sole with a low durometer sole.
- Be careful of creating a backflare
 - Premature heel strike
 - Forefoot slapping



Hidden flare



Hidden Flare



Stabilizer

- Also called a *buttress*.
- External stabilizer
 - Larger patient
 - Severe deformity
 - Safer than fiberglassing counter



Stabilizers (Buttresses)

- Have patient break in shoe slightly before applying
- Firm or rigid material



Excavation

- From the top in the hindfoot/midfoot
- From the underside in the forefoot
- Used to provide greater offloading in conjunction with custom foot orthosis
- Indications:
 - Chronic central heel pain
 - Prominent MTHs
 - Recurrent forefoot ulcers
 - Painful base of 5th MT in cavovarus foot
- To prevent “edge effect” this needs to be used with an orthotic interface between the plantar foot and the excavation.



Metatarsal Bar

- Effective for offloading MTHs, can be dangerous to walk in as it can catch on things like thresholds, stairs, sidewalk cracks, etc.
- Be very selective when deciding whether to employ it.



SACH Heel Insert

- Maximum shock attenuation at heel strike
- May be applied strategically to influence pronation or supination.
- Indications
 - s/p calc fx
 - Heel ulcer
 - s/p ankle fusion
 - Chronic heel pain and/or shin splints



Toe Skater

- Slick leather added under the distal toe area
- Helps reduce toe drag in someone with foot drop
- Used for falls prevention



Brace Prep

- This process involves removing the outsole and “prepping” the shoe for the attachment of a metal AFO stirrup by adding a midsole. The midsole gives the orthotic technician something more substantial to which she can anchor the stirrup.
- Can be actual midsole leather or can be firm SBR



Relasting as an
alternative to
custom shoes



“Diabetic” Footwear and Patient Compliance

- Numerous factors influence compliance and noncompliance

- Severity of foot deformity
 - Perceived and actual
- Sex
 - Compliance is worse in men
 - Women more likely to be dissatisfied
- Age
 - Younger = worse compliance
- Employment status
 - Unemployed = worse compliance
- Physical activity/BMI
 - Better physical condition = higher compliance
- Perceived value/Benefits of usage
 - Excellent predictor
- Aesthetics

Interestingly, history of ulcers and diabetes duration are not reliable predictors of adherence.

- Jarl, G., Tranberg, R., Johansson, U. *et al.* Predictors of adherence to wearing therapeutic footwear among people with diabetes. *J Foot Ankle Res* **13**, 45 (2020).
- Macfarlane DJ, Jensen JL. Factors in diabetic footwear compliance. *J Am Podiatr Med Assoc.* 2003 Nov-Dec;93(6):485-91. doi: 10.7547/87507315-93-6-485. PMID: 14623991.
- Jarl G, Lundqvist L. Adherence to wearing therapeutic shoes among people with diabetes: a systematic review and reflections. *Patient Prefer Adherence.* 2016;10:1521-1528
- Waaijman R, Keukenkamp R, de Haart M, Polomski WP, Nollet F, Bus SA. Adherence to wearing prescription custom-made footwear in patients with diabetes at high risk for plantar foot ulceration. *Diabetes Care.* 2013 Jun;36(6):1613-8. doi: 10.2337/dc12-1330. Epub 2013 Jan 15. PMID: 23321218; PMCID: PMC3661819.
- Malki A, Verkerke GJ, Dekker R, Hijmans JM. Factors influencing the use of therapeutic footwear in persons with diabetes mellitus and loss of protective sensation: A focus group study. *PLoS One.* 2023 Jan 12;18(1):e0280264. doi: 10.1371/journal.pone.0280264. PMID: 36634096; PMCID: PMC9836263.

Custom Shoes

- Pros
 - Higher reimbursement
 - Sometimes...



- Cons
 - Hideous
 - Take forever to get made
 - Very expensive
 - Huge learning curve
 - Rarely, if ever, fit properly



Pretty Decent Alternative to Custom...

Apis



Wish we still had...



Relasting (Sole Spread, Sole Expansion)

- Excellent alternative to custom shoes
- Lower cost
- Higher aesthetic appeal
- Improved patient acceptance = Better compliance



Indications

- Charcot arthropathy
- Stage III and IV PTTD/AAFD
- Congenital deformity
- Prominent base of 5th MT
- Accommodate AFO



Considerations

- Modifiability of shoe
- Will decreased depth be an issue?
- Could *possibly* shorten the shoe a bit
- Typically done to new shoe
- Unilaterally Vs. bilaterally
- Can be applied to:
 - Midfoot – easiest
 - Forefoot – not easy, but doable
 - Hindfoot – very difficult...but can be done



Materials

- Gap filler can be:
 - Firm viscoelastic polymers
 - Firm EVA
 - Rigid
- Shoe Goo



MIDFOOT



FOREFOOT



Insurance coverage concerns

- Many times, shoe modifications will not be covered by insurance.
- There are a handful that can be covered under Medicare's Therapeutic Shoes for Persons with Diabetes benefit.
 - Rocker soles (A5503)
 - Wedges (A5504)
 - Metatarsal bar (A5505)
 - Offset heels (A5506)
- There are a great many other shoe modification HCPCS codes that Medicare will cover in the instance that they are being done to a shoe that will be attached to an external brace.
- Commercial insurances, Medicaid, worker's comp...you will need to verify whether there is coverage.

The End