

# Footwear & the geriatric population

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Image 1.



# Objectives...

Following this presentation you will be able to:

- ▶ Explain why footwear is important to consider when working with older adult clients
- ▶ Describe basic footwear terminology
- ▶ Identify at least 5 considerations in shoe fitting
- ▶ Explain how footwear recommendations should be modified to accommodate common age-related foot problems
- ▶ Apply knowledge of footwear selection and fitting in clinical practice



Image II.



# Why is footwear important?<sup>1,2</sup>

- ▶ More than 1 out of 4 older people falls each year
- ▶ 1 out of 5 falls causes a serious injury
- ▶ Each year at least 300,000 older people are hospitalized for hip fractures
- ▶ Falls are the most common cause of traumatic brain injuries
- ▶ Falls cost approximately 29 billion dollars in 2010 <sup>2</sup>

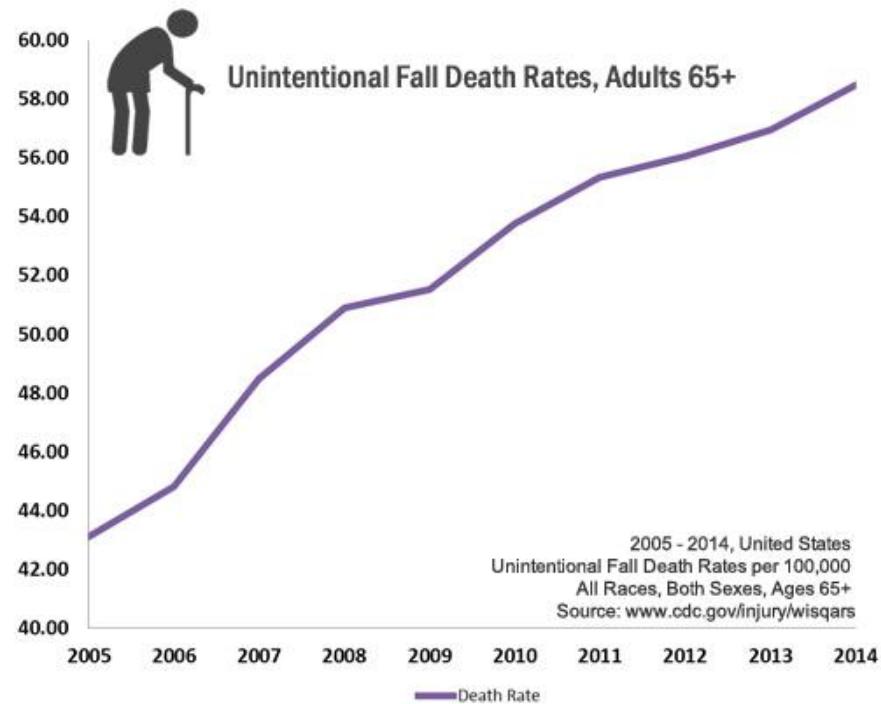


Image III.



# Footwear Terminology



Image IV.



# Sock liner<sup>3-6</sup>

- ▶ A thin and removable lining inside an athletic shoe above the insole

## Desirable characteristics:

- ▶ Comfortable
- ▶ Smooth with no creases or wrinkles
- ▶ Correctly sized to fit inside shoe

Image V.



Memory Foam Insoles

Image VI.



L.L.Bean® Superfeet  
Green Max Shock  
Absorption Insoles

Image VII.



Yaktrax™ Thermal Insoles



# Inner sole, Insole, or Last<sup>7-14</sup>

- ▶ An athletic shoe's foundation

- ▶ Beneath sock liner

3 common last shapes:

- ▶ Semi curved, curved, straight

Shoe parts attached to last:

- ▶ Upper, midsole, & outer sole

Last shoe material:

- ▶ Soft or firm

Image VIII.

Straight last

Curved last



Image IX.



Image X.



Straight last

Semi-curved last

Curved last

Image XI.



# Midsole<sup>9,12,15</sup>

- ▶ Underneath the insole
- ▶ In-between the insole and outer sole

## With athletic shoes:

- ▶ Provides most of the structural support & cushioning

Image XII.



# Outer sole<sup>3,7,12,15-20</sup>

- ▶ Outermost material along the base from the forefoot to heel area
- ▶ Protects foot
- ▶ Decreases external forces acting on feet

## Tread width and depth:

- ▶ Can promote postural stability

## Tread design:

- ▶ Can impact traction on different floor surfaces

Image XIII.



Image XIV.

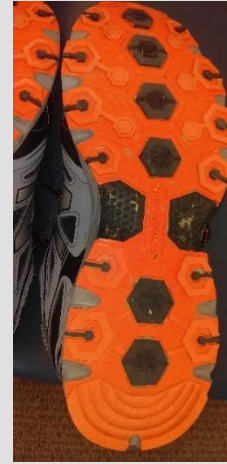


Image XV.



Image XVI.



Image XVII.



Yaktrak Walker®

Image XVIII.



Image XIX.





# Rocker Bottom sole<sup>10,19,21</sup>

- ▶ Describes a convex surface within either a portion or entire outer sole

Peak of convex surface location:

- ▶ Forefoot, midfoot
- ▶ Can help reduce ground reaction forces acting on foot during gait

Image XX.



Image XXI.



# Base of support (BOS)<sup>18,19</sup>

- ▶ Total surface area beneath the shoe
- ▶ Is a key component of a shoe recommendation

## Examine:

- ▶ Amount of surface area in the anterior to posterior & medial to lateral directions

Image XIII.



Image XXII.



Image XVIII.



Image XXIII.



# Collar<sup>3,22</sup>

- ▶ Most superior portion of the shoe which encircles ankle

## Desirable characteristics:

- ▶ Comfortable
- ▶ Soft
- ▶ Padded

Image XXIV.



Image XXV.



# Heel counter<sup>3,22</sup>

- ▶ Posterior middle to inferior portion of shoe
- ▶ Surrounds heel
- ▶ Requires structural support for heel strike

Image XXVI.



Image XXVII.



Image XXVIII.



Image XXX.



Image XXIX.



Heel counter



Image XXXI.

# Upper<sup>3,16,22</sup>

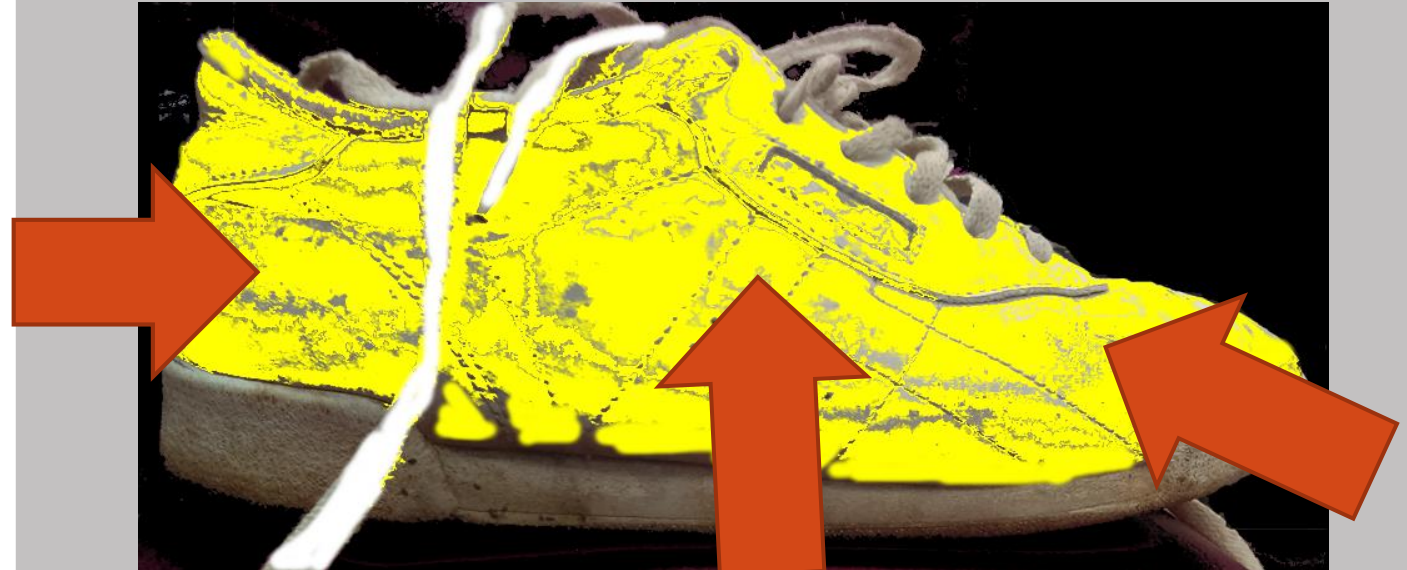
- ▶ Upper part of a shoe
- ▶ Attaches to last, midsole, & outer sole

## Contains:

- ▶ Toe box, vamp, throat, tongue, collar, & heel counter

## Beneficial characteristics of leather:

- ▶ Durable
- ▶ Antifungal
- ▶ Comfortable
- ▶ Flexible



# Toe box<sup>3,16</sup>

- ▶ Area at front of a shoe where toes are positioned

Can be described as:

- ▶ Shallow or deep

Involves: height between sock liner & upper surface of toe box

- ▶ Narrow or wide

Involves: toe box width

Possible shapes:

- ▶ Round, triangular, rectangular

Image XXXII.



Image XXXIII.



Image XXXIV.



Image XXXV.



Image XXXVI.



# Vamp<sup>3,22-25</sup>

Contains the:

- ▶ Toe box, throat, & tongue
- ▶ Is secured to the insole, midsole, & outer sole

Can be considered:

- ▶ Narrow or wide

Image XXXVII.

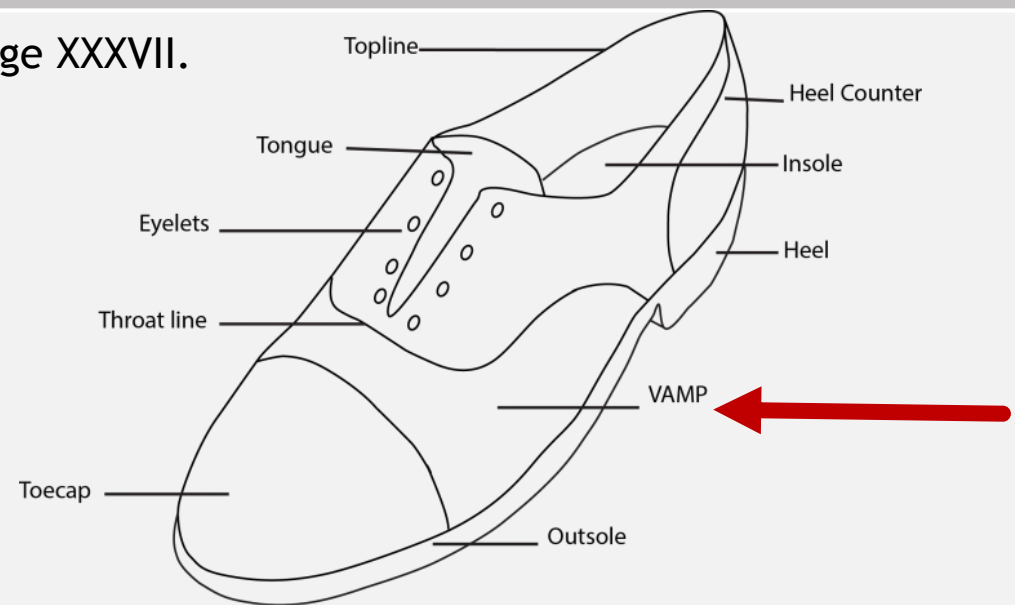
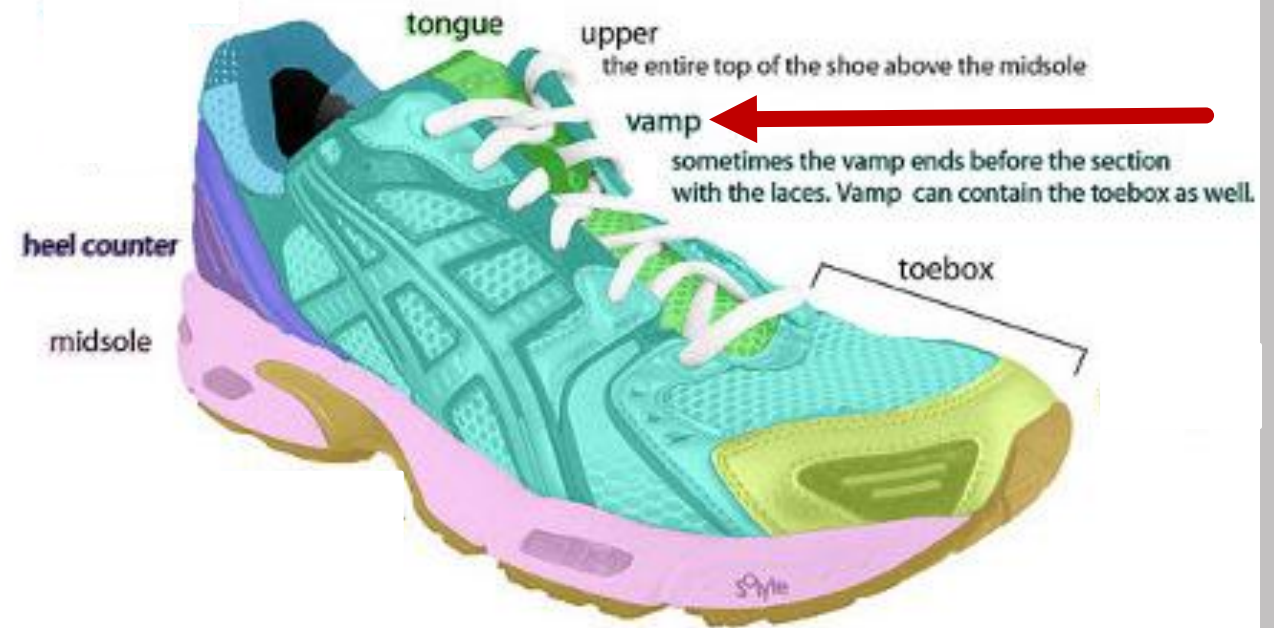


Image XXXVIII.



# Toe Break<sup>10,19,23</sup>

- ▶ Describes a crease within the toe box & vamp areas
- ▶ Crease is result of ground reaction forces during ambulation

Image XXXIX.





# Tongue<sup>3,22</sup>

- ▶ Middle piece of shoe material
- ▶ Comes up from toe box and goes underneath shoe's fastening mechanism
- ▶ Protects dorsum of foot
- ▶ Prevents skin irritation from shoe's fastening mechanism

Image XXV.



Image XL.



# Throat<sup>23,25</sup>

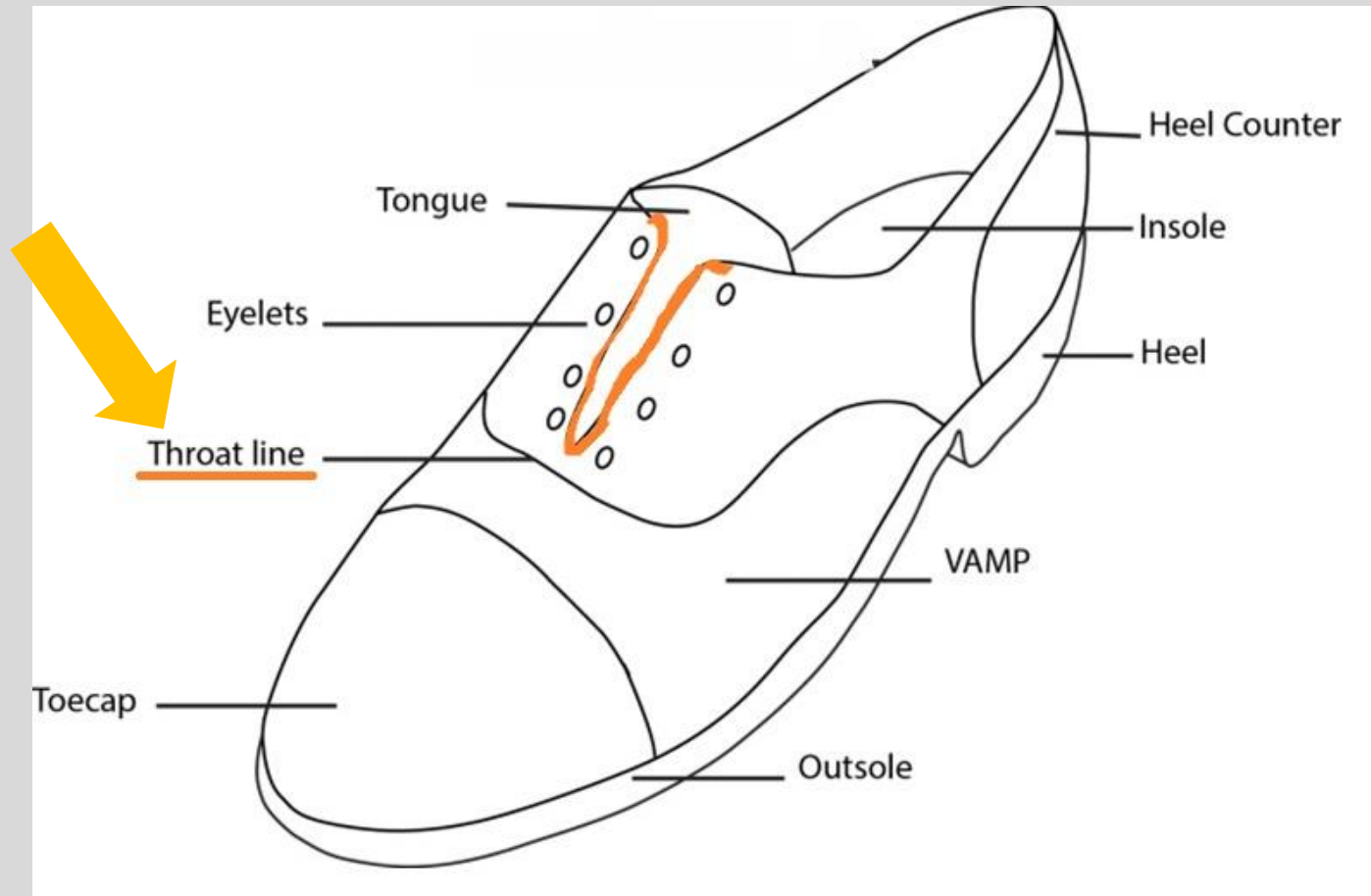
Spans from:

- ▶ Middle of the vamp to anterior collar
- ▶ Determines a shoe's maximum girth
- ▶ Doesn't include toe box

Borders of throat contain:

- ▶ Lacing or fastening mechanism

Image XXXVII.



# Blucher Opening<sup>3,23,26</sup>

## Involves:

- ▶ 2 separate pieces or flaps of shoe material in throat area
- ▶ Tongue in-between 2 flaps
- ▶ 2 flaps are secured to vamp & toe box area separately
- ▶ Wide opening
- ▶ Provides good toe box depth
- ▶ Can accommodate shoe modifications

Image XLI.



# Balmoral Opening<sup>23,26</sup>

- ▶ When the two borders of throat attach proximal to toe box as a “V shape”<sup>23</sup>

Image XLII.



# Pitch<sup>16</sup>

Refers to:

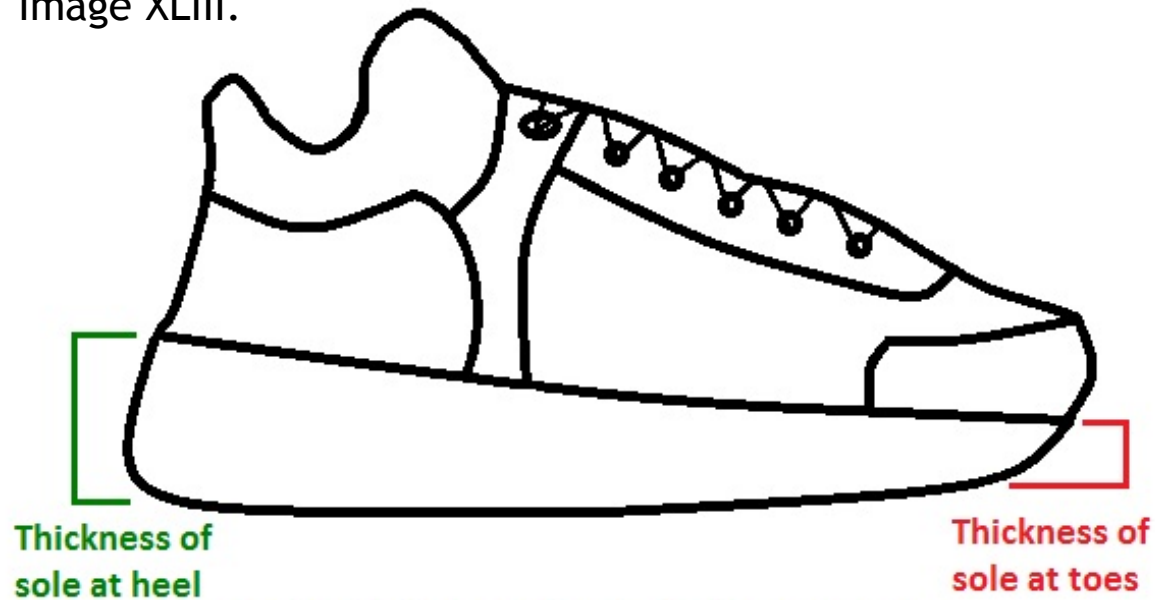
- ▶ Mid to outer sole height throughout length of shoe

Pitch: Heel-Forefoot difference

## Pitch Categories:

Flat	0 to 0.9cm
Small Heel Rise	1.0 to 3.0cm
Large Heel Rise	>3.0cm

Image XLIII.



Pitch = Thickness at heel - Thickness at toes

Image XLIV.



# Key considerations for a shoe fitting: <sup>3,16,19,27,28</sup>

## Shoe characteristics:

- ▶ Last shape
- ▶ Toe box
- ▶ Vamp & Throat Width
- ▶ Shoe length; Rule of thumb

Too short	<0.5 thumb's width
Good	0.5 to 1.5 thumb's width
Too Long	>1.5 thumb's width

- ▶ Heel Counter
- ▶ Heel & Pitch Height
- ▶ BOS

## Additional Features:

- ▶ Ease of donning & doffing
- ▶ Comfort

## Other considerations:

- ▶ Has the client fallen recently?
- ▶ AD use
- ▶ Community or household ambulator?

## Client Education:

- ▶ Breaking in shoes

## Shoe inspection:

- ▶ Before donning

## Skin inspection:

- ▶ Before & after donning/doffing shoes

Image XLV.

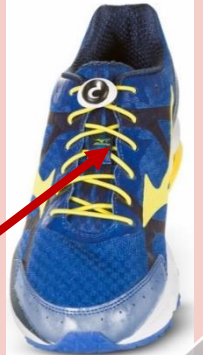


E Z Reacher

Image XLVI.



Image XLVII.



Elastic Laces



# What can affect a client's purchase or choice of footwear?<sup>18,28,29</sup>

- ▶ Shoe appearance
- ▶ Shoe characteristics
- ▶ General fit
- ▶ Employment
- ▶ Finances
- ▶ Retail availability

Image XLVIII.



# Characteristics of Aging:\*

- ▶ Nervous system changes
- ▶ Integumentary & musculoskeletal changes
- ▶ Higher likelihood of comorbidities
- ▶ Increased chance of foot deformity

Image XLIX.



\* Resources listed in slide notes





# Nervous System Changes<sup>30-33</sup>



Image L.

## Decreased:

- ▶ Myelin
- ▶ Skin receptors
- ▶ Muscle spindle sensitivity
- ▶ Fine motor coordination
- ▶ Reflex timing & amplitude
- ▶ Dynamic balance ability

## Other changes:

- ▶ Gait pattern
- ▶ Increased risk of falls

### Suggested shoe characteristics:

A large BOS, low heel, smooth fitting sock liner, adequate: toe box width & depth, vamp width, shoe depth, appropriate: toe box & last shape, a high collar

### Shoe characteristics to avoid:

Flexible upper, increased heel height, thickened mid to outer sole



# Footwear conditions that increase falls

**risk:** 18,19,31,34

- ▶ Barefoot
- ▶ Socks or stockings only
- ▶ Loafers or slip on shoes
- ▶ Slippers
- ▶ Minimalist shoes
- ▶ High heels



# Shoe characteristics that can increase falls risk: <sup>16,18,19,21,33,35,36</sup>

- ▶ Inappropriate shoe fit
- ▶ No fastening mechanism
- ▶ Soft mid or outer sole material
- ▶ Reduced base of support
- ▶ Increased heel height
- ▶ Narrow heel
- ▶ Forefoot or midfoot rocker bottom



Image LI.

Women's  
TOMS shoe



# Shoe types that decrease falls risk: <sup>19,29,33,34</sup>

- ▶ Athletic shoes
- ▶ Walking shoes

Image LII.



Image XXV.



# Shoe characteristics that

**decrease falls risk:** 16,18,19,27,29-31,33,34,36

- ▶ Appropriate shoe fit & toe box shape
- ▶ Adequate toe box width & depth
- ▶ High collar versus low collar
- ▶ Vamp width
- ▶ Low heel
- ▶ Firm heel counter
- ▶ Slip resistant outer sole
- ▶ Supportive mid to outer sole materials
- ▶ Adequate tread
- ▶ Large base of support



# Shoe modifications which enhance balance:<sup>2,18,30,33,36-38</sup>

- ▶ Arch support inserts
- ▶ Inserts with vibration components
- ▶ Custom orthoses made of various materials



# Integumentary & Musculoskeletal Changes<sup>3,19,29,30,33,39</sup>

- ▶ Increasingly fragile skin
- ▶ Deterioration of subcutaneous fat pads
- ▶ Deterioration of bones and joints
- ▶ Reduced muscle strength
- ▶ Decreased flexibility

Client may present with:

- ▶ Hallux Rigidus
- ▶ Increased tension within triceps surae musculature

Image LIII.



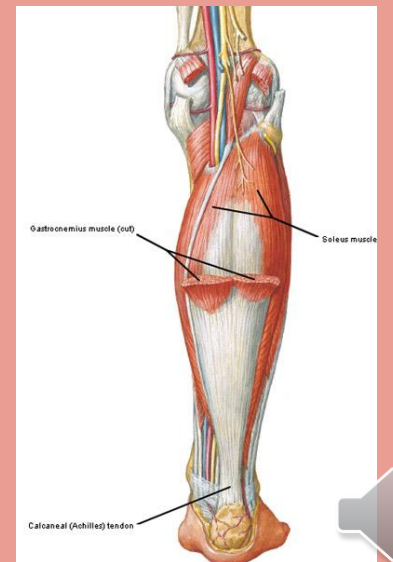
Adjust-A-Lift Heel Lift

Suggested shoe characteristics:

Adequate: toe box width & depth, shoe depth,  
appropriate: toe box shape

Suggested shoe modification:  
Heel lift

Image LIV:



# Pes Cavus or Planus?<sup>40,41</sup>

- ▶ Characteristics of medial arch
- ▶ Pes Cavus: high arch
- ▶ Pes Planus: flat feet

Image LV.



Pes Planus

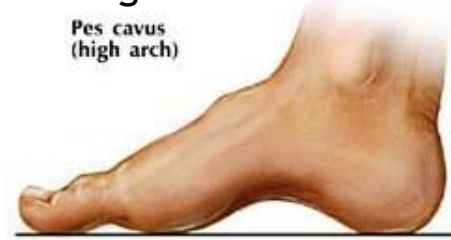
Image LVI.



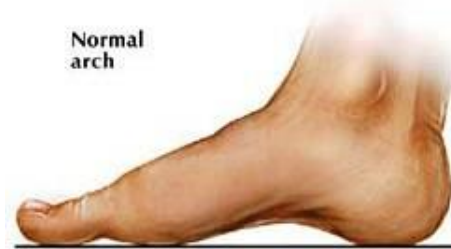
Pes Cavus

Image LVII.

Pes cavus  
(high arch)



Normal  
arch



Pes planus  
(flatfoot)





# Pes Cavus<sup>40,42-49</sup>

Higher risk for developing:

- ▶ Metatarsalgia, Morton's Neuroma, and Plantar Fasciitis

Image LVI.



Suggested shoe characteristics:

Low heel, shock-absorbent mid & outer sole, adequate: toe box width & depth, shoe depth, appropriate: toe box & last shape, shoe length, firm heel counter

Supplemental shoe modifications:

Heel lifts, metatarsal pads, over the counter arch support, custom foot orthoses made of semi-rigid or rigid materials



# Pes Planus<sup>41,42-44, 46,50,51</sup>

Higher risk for developing:

- ▶ Plantar fasciitis

Image LV.



Suggested shoe characteristics:

Shock-absorbent mid & outer sole, adequate: toe box width & depth, shoe depth, appropriate: toe box & last shape, shoe length, firm heel counter

Supplemental shoe modifications:

Custom foot orthoses with semi-rigid or rigid materials, “over the counter arch support”



# Higher likelihood of comorbidities<sup>8,51,53-56</sup>

- ▶ Arthritis
- ▶ Cardiovascular disease
- ▶ Diabetes



# Arthritis<sup>8,19,56-59</sup>

## Gout Signs & Symptoms:

- ▶ Redness surrounding a joint
- ▶ Pain
- ▶ Warmth
- ▶ Reduced PROM/AROM

### Suggested shoe characteristics & shoe modifications for medial compartment knee OA:

A lateral wedge insert, flexible upper, mid, & outer sole

Shoe styles to avoid: high heels

### Suggested shoe characteristics & shoe modifications for lateral compartment knee OA:

A medial wedge insert, firm upper, mid, & outer sole



# Venous & Arterial Insufficiency<sup>8,60,61</sup>

- ▶ These individuals should *be referred* to appropriate healthcare practitioners for footwear recommendations

Venous Insufficiency	Arterial Insufficiency
<p><u>Suggested shoe characteristics:</u> Low heel, smooth sock liner, adequate: toe box width &amp; depth, shoe depth, appropriate: toe box &amp; last shape, flexible upper</p>	<p><u>Suggested shoe characteristics:</u> A smooth sock liner and inner perimeter of the shoe, adequate: toe box width &amp; depth, shoe depth, appropriate: toe box &amp; last shape</p>
<p><u>Shoe styles &amp; characteristics to avoid:</u> High heels, increased heel height, firmly fastened footwear</p>	<p><u>Shoe characteristics to avoid:</u> Reduced BOS, narrow toe box or vamp width, shortened shoe length</p>



# Diabetes<sup>3,42,52,62-67,70</sup>

- ▶ Clients with diabetes who have Medicare Part B may be eligible for: custom shoes, orthoses, or shoe modifications
- ▶ Clients with diabetes should wear socks with shoes

## Socks:

- ▶ Should not be too tight or too loose
- ▶ Individuals with diabetes may not be appropriate candidates for participation in community footwear programs

## Suggested shoe characteristics:

A low heel, cushioned outer sole, smooth sock liner & inner perimeter of shoe liner, adequate, toe box width & depth, shoe depth, appropriate last shape, shoe length, flexible upper material, padded tongue, light weight, shoelace fastening, stiff toe break, forefoot rocker bottom outer sole, flat outer sole surface beneath heel, total contact inner sole

## Shoe styles & characteristics to avoid:

High heels, sandals, slip ons, open toe or heel, men's dress shoes with hard insole, midsole, & outer sole, increased heel height, narrow toe box, lack of a shoe lace fastening mechanism



# Pressure Injury<sup>67-72</sup>

- ▶ Sites for ulcer development: along the outside border of the foot, beneath the: great toe or heel, distal ends of metatarsal heads
- ▶ These individuals should *be referred* to appropriate healthcare practitioners for footwear recommendations

Image LVIII.



**AIR CAM® Adjustable Walker Boot**

<p>▶ <u>Suggested shoe characteristics</u>:</p>	<p>▶ Firm mid &amp; outer sole, adequate: toe box width, depth, and vamp width, extra depth shoes, appropriate: toe box &amp; last shape, shoe length, heel counter fit</p>
<p>▶ <u>Supplemental shoe modifications</u>:</p>	<p>▶ Custom orthoses (total contact orthosis, toe filler orthosis, multi-layer orthosis), custom shoes or pads</p>
<p>▶ <u>Alternative shoe devices</u>:</p>	<p>▶ Total contact cast, ankle foot orthosis, a wedge shoe (DARCO), a controlled ankle motion walker (CAM)</p>
<p>▶ <u>Shoe styles to avoid</u>:</p>	<p>▶ Regular or non-customized shoes</p>

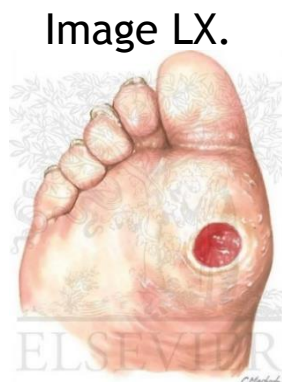


Image LIX.



**DARCO OrthoWedge®**



# Increased chance of foot deformity<sup>16,19,42,43,44,63,73-82</sup>

- ▶ Bunion
- ▶ Hammer toe
- ▶ Hallux rigidus
- ▶ Heel spur





# Bunion<sup>73,74</sup>

## Involves:

- ▶ A valgus directed formation at distal end of hallux MTP joint
- ▶ A bony prominence on the medial aspect of the hallux MTP joint

## Signs & Symptoms:

- ▶ Pain with great toe extension & weight bearing
- ▶ Decreased AROM of hallux
- ▶ Swelling surrounding hallux MTP joint
- ▶ Callus superior to hallux MTP joint

Image LXI.



Image LXII.



Image LXIII.



# Recommended shoe characteristics for a bunion<sup>73,74</sup>

## Suggested shoe characteristics:

Adequate: toe box width & depth, shoe length, appropriate: vamp width, shoe depth, heel counter fit

## Supplemental shoe modifications:

Over the counter “bunion-shield”<sup>71</sup> pads, taping, custom foot orthoses, toe spacers, or a great toe splint

## Shoe characteristics to avoid:

A shallow & narrow toe box, narrow vamp width, shallow shoe depth, shortened shoe length

Image LXIV.



Gel Bunion  
Shield Pad

Image LXV.

Toe Spacer



# Hammer toe<sup>16,63,75,76</sup>

- ▶ Distal phalanges of foot point inferiorly
- ▶ Usually involves: 2<sup>nd</sup> toe
- ▶ Can develop with other toes

## Signs & Symptoms:

- ▶ Pain during weight bearing
- ▶ Reduced toe(s) PROM/AROM
- ▶ Possible corn on dorsal aspect of affected toe
- ▶ Possible callus beneath ball of the foot

Image LXVI.



Image LXVII.



## Suggested footwear characteristics:

Low heel, adequate: toe box width & depth, shoe depth, appropriate: toe box shape, shoe length, flexible upper, padded tongue

## Shoe styles & characteristics to avoid:

High heels, narrow & shallow toe box, triangular shaped toe box, narrow vamp width, shortened shoe length



# Hallux Rigidus<sup>19,42,77</sup>

- ▶ Involves: hallux MTP joint & proximal phalanx (hallux)

## Signs & Symptoms:

- ▶ Reduced & painful great toe extension at hallux MTP joint
- ▶ Pain
- ▶ Swelling surrounding hallux MTP joint
- ▶ Bump directly superior to hallux MTP joint

Image LXVIII.

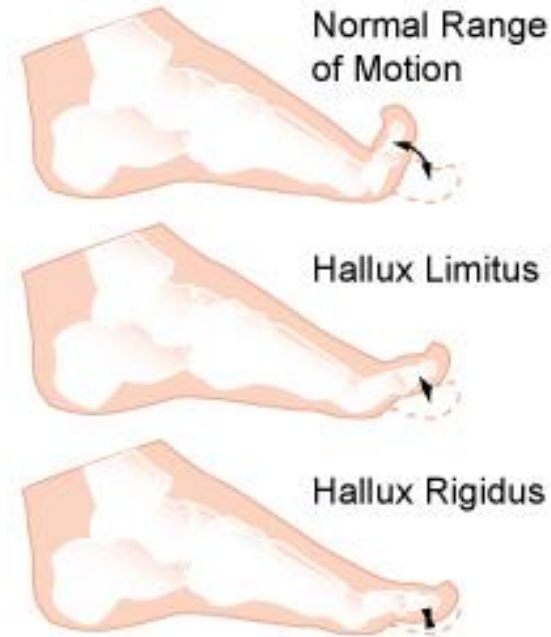
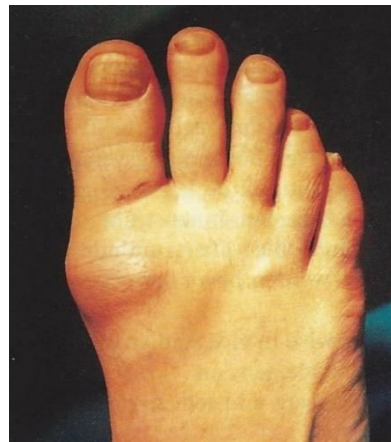


Image LXIX.



Suggested shoe characteristics:  
Rigid outer sole material, adequate: toe box width & depth, shoe depth, appropriate: toe box shape, a stiff toe break, forefoot rocker bottom outer sole, flat outer sole surface beneath heel

Supplemental shoe modifications:  
Insertion of extra stiff material to the insole, custom foot orthoses, or outer sole, metatarsal pads

Shoe styles & characteristics to avoid:  
high heels, soft outer sole, thin mid to outer sole

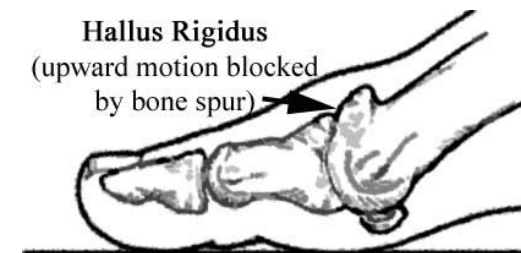


Image LXX.



# Heel Spur<sup>43,44,76,78-82</sup>

Involves: “Bony growth”<sup>77</sup>

Signs & Symptoms:

- ▶ Possible pain during weight bearing

If client has plantar fasciitis:

- ▶ *Pain*: dull, sharp, burning, aching
- ▶ *Pain*: during weight bearing, especially with initial steps getting out of bed in morning

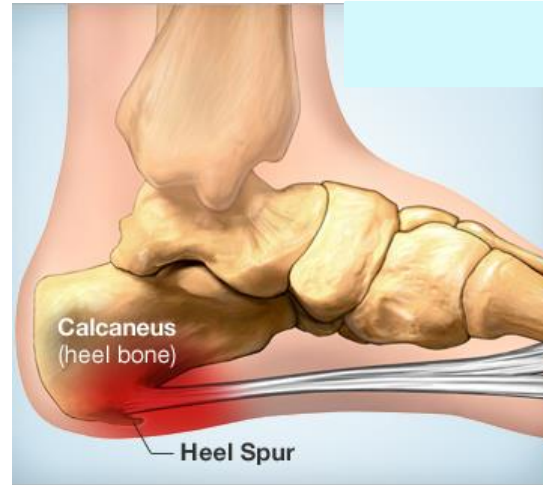
Locations:

- ▶ Proximal to Achilles Tendon insertion, anterior to plantar fascia insertion

Contributing factors:

- ▶ Repetitive & constant loading

Image LXXI.



Suggested shoe characteristics:

Shock-absorbent outer & mid sole, adequate: toe box width & depth, vamp width, appropriate: last shape, shoe length, a firm heel counter

Supplemental shoe modifications:

Heel pads, over the counter arch support, custom foot orthoses



# Client Scenario #1 G.S.

G.S. is a 69 year old male who presents with bilateral LE sensory loss, mild proximal weakness, bilateral limited hallux extension, and standing balance deficits. G.S. has repeatedly fallen within the past year reporting about 7 to 8 falls. G.S. stands with a wide base of support. G.S. also has a bunion on both feet at the distal end of the first metatarsal heads.

G.S. works as a security officer fulltime. He's looking for supportive and comfortable footwear to address the bilateral foot pain he has when weight bearing. He doesn't use an AD for ambulation. G.S. recently received a pair of customized foot orthoses.

## ► Performance Tests:

R LE

L LE

SLS 6 seconds

SLS 15 seconds

Image LXXVI.



G.S. barefoot while seated:

Image LXXII.



L foot hallux extension:

Image LXXIII.



Custom foot orthoses:

Image LXXV.



Image LXXIV.

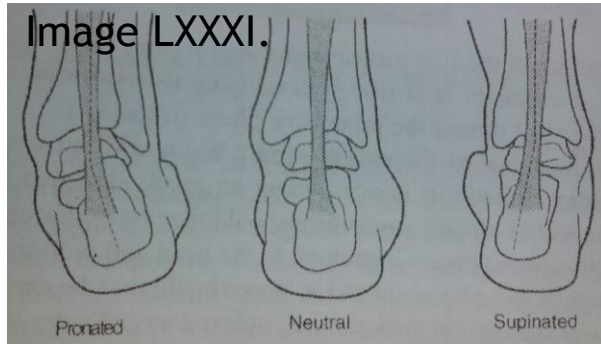


# G.S.<sup>83</sup>

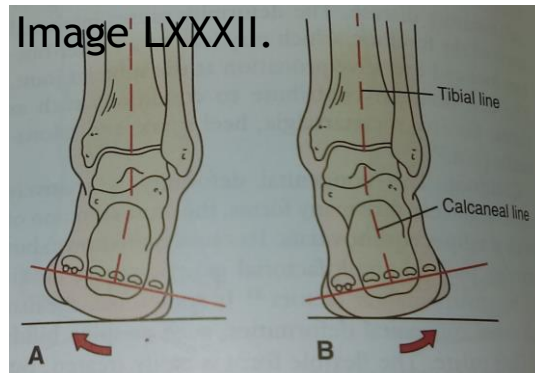
G.S. seated with custom foot orthoses:



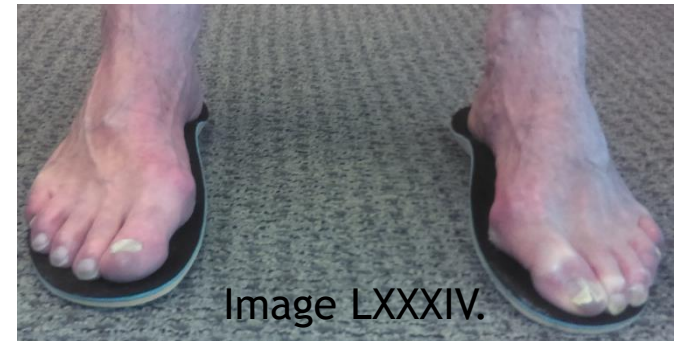
G.S. standing without custom foot orthoses:



A: Hindfoot varus  
B: Hindfoot valgus



G.S. standing with custom foot orthoses:



# G.S.

First pair of athletic shoes worn:

Image LXXXV.



Image LXXXVI.



Image LXXXVII.



Image XXXIX.



Image LII.



Image LXXXVIII.





# G.S.

Preferred pair of athletic shoes:

Image LXXXIX.



Image XC.



Image XCI.



Image XCII.



Preferred pair of work boots:

Image XCIII.



Image XCIV.



Image LXV.



Image XCVI.



# G.S.

Preferred Velcro™ athletic shoe. In the video at right G.S. is wearing the shoes shown below.

Image XXV.

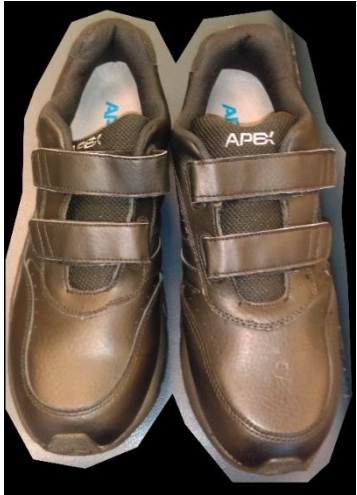


Image XCVII.



Image XLIV.



Image C.

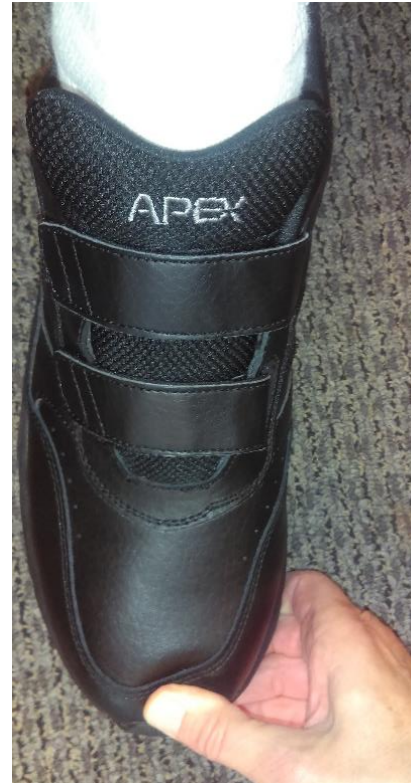


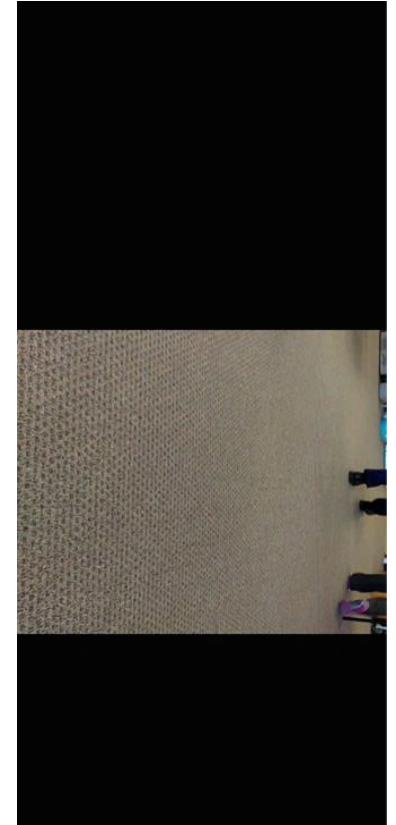
Image XCVIII.



Image XCIX.



Click on the video to view G.S. walking in the Velcro™ shoes:



# G.S. & SLS test

Click on both videos to compare his SLS balance in only socks and then with Velcro™ shoes.



# Other lower extremity conditions<sup>47-49,85</sup>

- ▶ Morton's neuroma
- ▶ Metatarsalgia
- ▶ Plantar fasciitis
- ▶ Partial foot amputations
- ▶ Leg length discrepancy



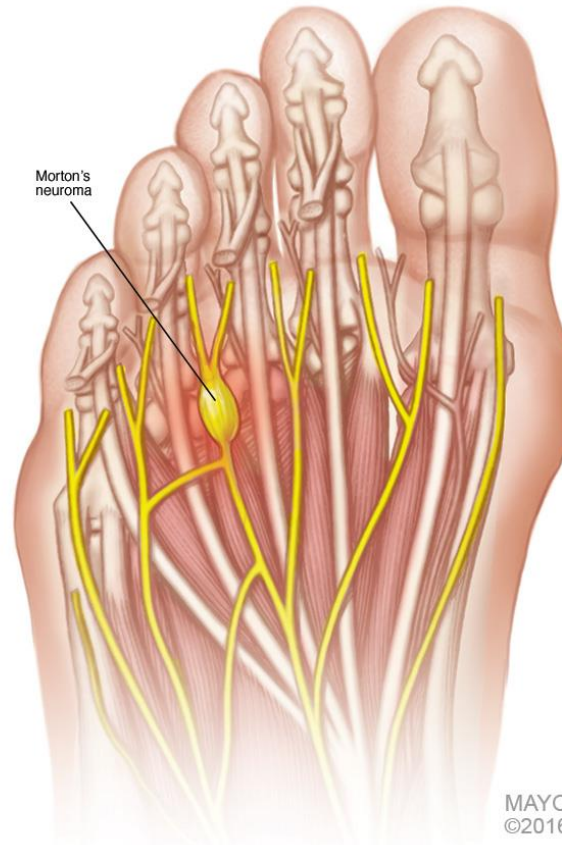
# Morton's Neuroma<sup>48,49,70,71</sup>

## Involves:

- ▶ Nerves within metatarsal area
- ▶ 3<sup>rd</sup> & 4<sup>th</sup> toes

## Signs & Symptoms:

- ▶ Pain: sharp
- ▶ Location: ball of the foot, in-between toes



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Image Cl.

## Suggested shoe characteristics:

Low heel, adequate: toe box width & depth, vamp width, appropriate: toe box shape (round), shoe length

Supplemental shoe modifications: Metatarsal pads

## Shoe characteristics to avoid:

Heels over 2 inches in mid to outer sole height, triangular or pointed toe box shape



# Metatarsalgia<sup>47,71,84,85</sup>

## Involves:

- ▶ Metatarsals

## Signs & Symptoms:

- ▶ Location: beneath ball of the foot
- ▶ Pain: sharp, tingling



## Suggested shoe characteristics:

Low heel, shock absorbent mid & outer sole, adequate: toe box width & depth, vamp width, appropriate: toe box shape, shoe length, stiff toe break, forefoot rocker bottom, flat outer sole surface beneath heel

## Supplemental shoe modifications:

“Over the counter arch support,” metatarsal pads

## Shoe styles & characteristics to avoid:

High heels, increased heel height, a shallow & narrow toe box, narrow vamp width, shortened shoe length



# Plantar Fasciitis<sup>8,43,44,82</sup>

## Involves:

- ▶ Inflammation of plantar fascia

## Signs & Symptoms:

- ▶ *Pain:* ache, dull, sharp, burning
- ▶ *Pain:* during weight bearing, especially with initial steps getting out of bed

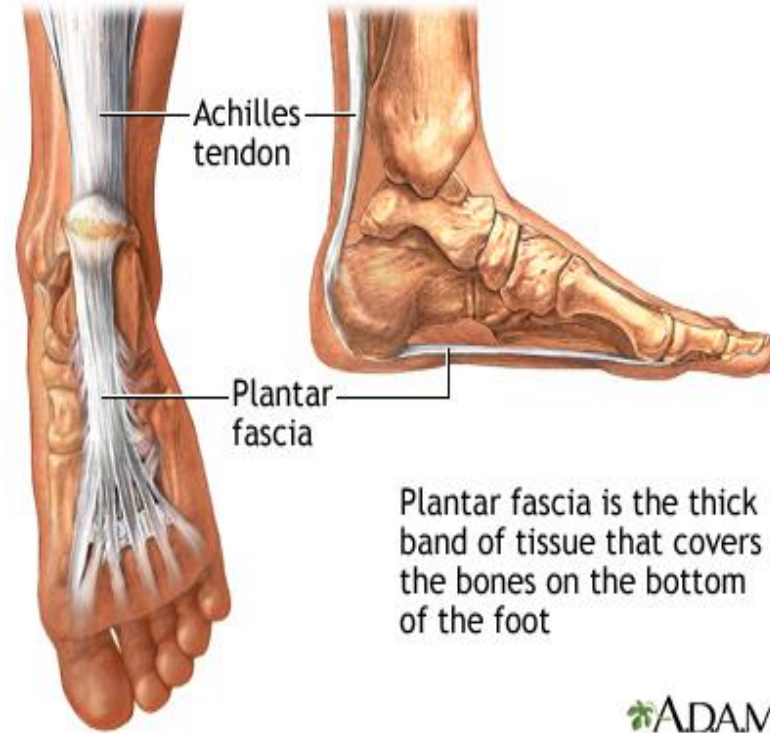


Image CIII.

## Suggested shoe characteristics:

Shock-absorbent mid & outer sole, adequate toe box width & depth, vamp width, appropriate: last shape, shoe length, firm heel counter

## Supplemental shoe modifications:

Over the counter arch support, custom foot orthoses, heel pads



# Partial foot amputations<sup>52,86,87</sup>

Can involve the:

- ▶ Great toe
- ▶ Other toes

Other types of partial foot amputations:

- ▶ Transmetatarsal, Lisfranc, Chopart



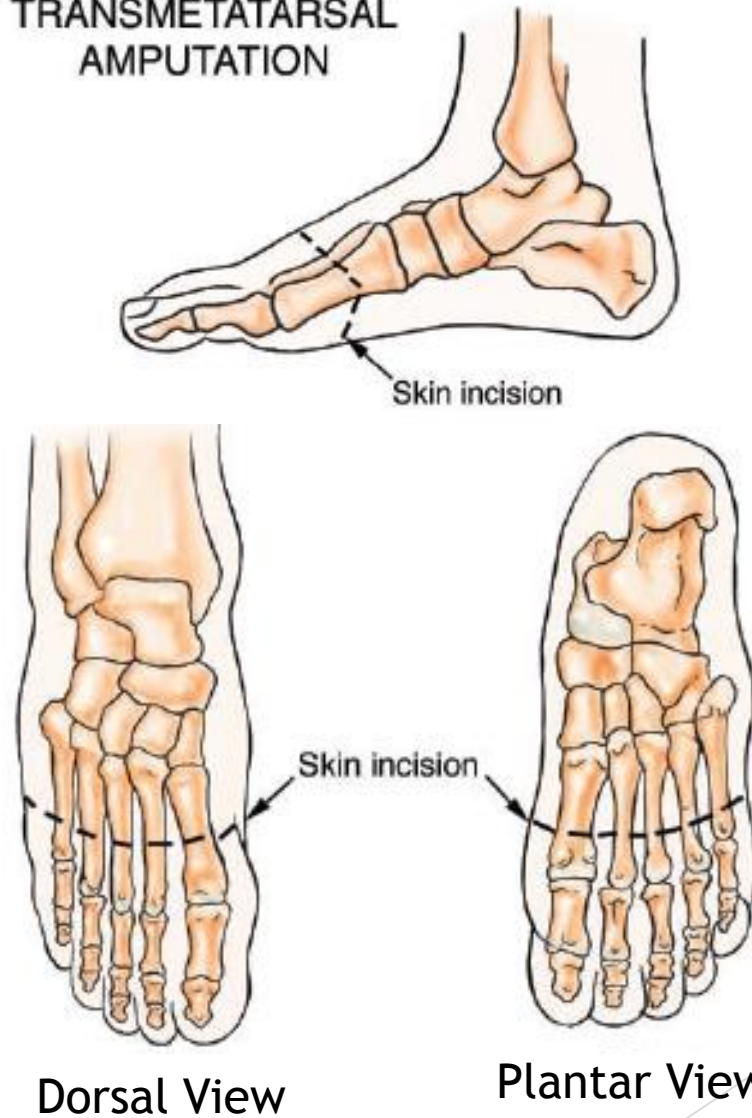


# Transmetatarsal amputation<sup>86</sup>

- ▶ Removes portion of the extremity distal to middle of metatarsals

Image CIV.

## TRANSMETATARSAL AMPUTATION



# Lisfranc amputation<sup>86</sup>

- ▶ Removes portion of the extremity distal to metatarsals



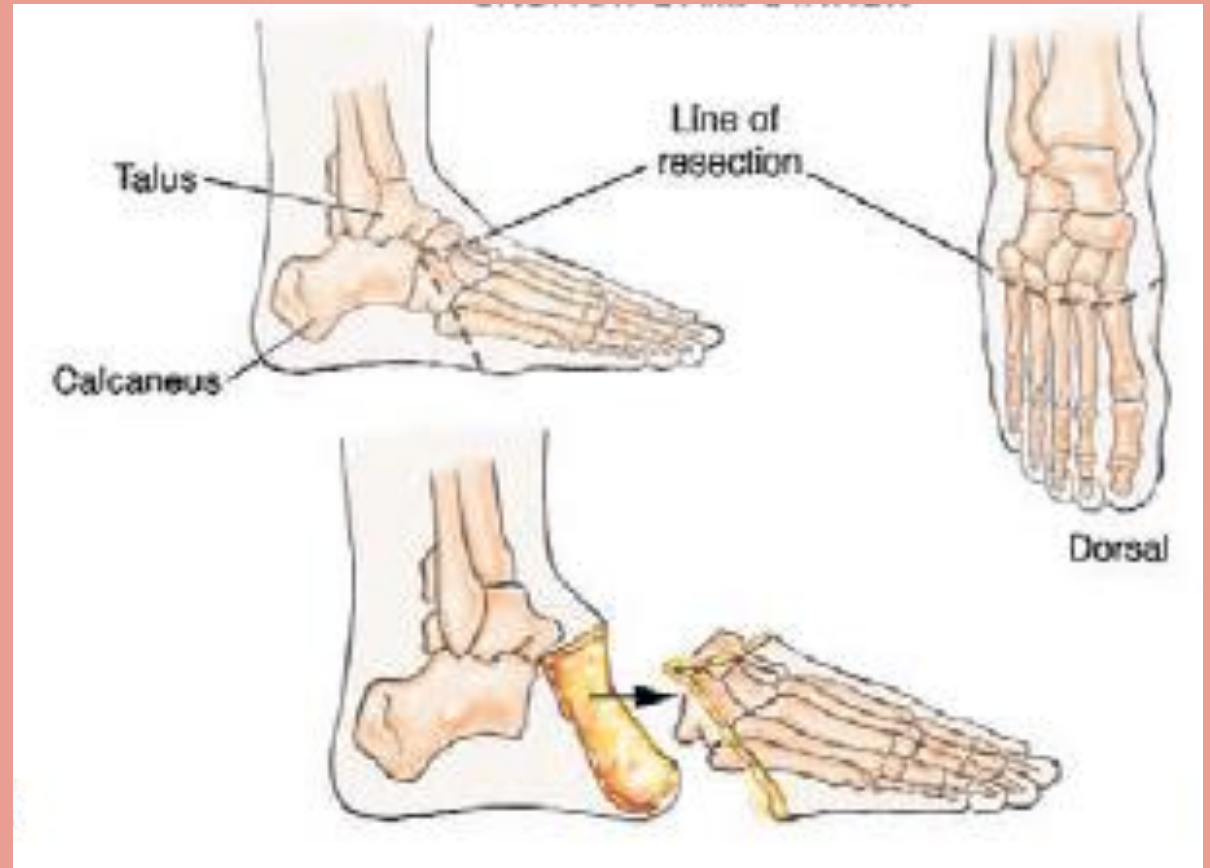
Image CV.



# Chopart Amputation<sup>86</sup>

- ▶ Removes portion of the extremity distal to talus & calcaneus

Image CVI.



# Recommended shoe characteristics for a partial foot amputation<sup>69,87,88</sup>

Image CVII.



Toe Filler

## Suggested shoe characteristics:

A rigid mid & outer sole, adequate: toe box width & depth, vamp width, shoe depth, appropriate: toe box shape, last shape, shoe length, firm heel counter, flexible upper, wide throat, Velcro™ or lacing fastening, forefoot rocker bottom outer sole, custom full length shoe

## Supplemental shoe modifications:

Custom foot orthoses, toe filler orthosis, or prosthesis



# Limb Length Discrepancy (LLD)<sup>8,89-92</sup>

- ▶ Structural LLD
- ▶ There's a 50% chance a person >60 years will have a structural LLD!

Image CVIII.



Image CIX.



Full Foot Lift

Image LIII.



Adjust-A-Lift Heel Lift

## Suggested shoe characteristics:

Adequate: toe box width & depth, throat width, vamp width, shoe depth, appropriate: toe box shape, last shape

## Supplemental shoe modifications:

Medial longitudinal arch inserts, a custom full length or full foot lift, metatarsal pads, heel pads, heel lifts



# Signs athletic shoes should be replaced<sup>15,19,93,94</sup>

- ▶ Athletic Shoe Ambulation Lifespan: 300-500 miles

<p><u>Toe Box:</u></p>	<p><i>Examine:</i> Toe box area <i>Look for:</i> Fraying, holes</p>
<p><u>outer sole:</u></p>	<p><i>Examine:</i> Tread depth within BOS, areas of wear <i>Replacement needed:</i> &gt; 4mm difference in heel height between medial &amp; lateral heel area</p>
<p><u>Mid sole:</u></p>	<p><i>Look for:</i> Creasing <i>Anterior &amp; posterior view of shoes on flat surface:</i> Observe for uneven mid to outer sole shape</p>
<p><u>Heel Counter:</u></p>	<p><i>Evaluate:</i> Firmness <i>Posterior view of shoes on flat surface:</i> Observe for medial or lateral deviation of collar &amp; heel counter</p>

Image CX.



Image CXI.



Image CXII.

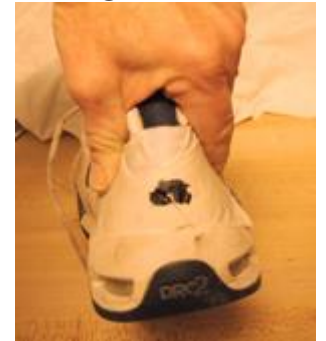


Image CXIII.



## Client Scenario #2 B.W.

B.W. is a 62 year old female who has fallen twice within this past year. One of these falls took place during the winter with snow on the ground. She describes her overall balance as “bad” and that she “walks slow.” She has a history of two strokes. B.W. uses a single point cane for ambulation.

### Performance Tests:

TUG: >20 seconds

SLS with R or L LE: 0 sec

Image CXIV.



# B.W.

Usual shoes worn daily:

Image XXXIII.



Image CXV.



Image CXVI.



Walking with her usual footwear below:





# Free Your Feet – Footwear Program

Free Your Feet  
Footwear  
Program<sup>95,96-100</sup>

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Location: \_\_\_\_\_

**SUBJECTIVE: C/C Related to Shoes:** \_\_\_\_\_

**Pain with:** Walking Sitting Standing Stairs **Other:** \_\_\_\_\_

**Where:** Arch Heel Dorsum MT (1-5) \_\_\_\_\_ Ankle(Medial/Lateral) \_\_\_\_\_ Other \_\_\_\_\_

**Pt. report of Current Shoe Fit:** Tight \_\_\_\_\_ Loose \_\_\_\_\_ Heel slip \_\_\_\_\_ Unstable \_\_\_\_\_ Slippery \_\_\_\_\_

**Other:** \_\_\_\_\_

## **OBJECTIVE:**

**Brannock Measurement:** L Toe \_\_\_\_\_ Arch \_\_\_\_\_ Width \_\_\_\_\_ R Toe \_\_\_\_\_ MTP \_\_\_\_\_ Width \_\_\_\_\_

**Gait:** Antalgic \_\_\_\_\_ Trendelenburg R L **Decreased stance time:** R L **Short step length:** Y / N

## **POSTURAL OBSERVATION:**

**(Front) IC Height:** Higher R \_\_\_\_\_ L \_\_\_\_\_ **ASIS:** Higher R \_\_\_\_\_ L \_\_\_\_\_ **Grt Troch:** Higher R \_\_\_\_\_ L \_\_\_\_\_

**LLD:** Y N **Shorter** R \_\_\_\_\_ L \_\_\_\_\_ **Knee:** Varus / Valgus Notes: \_\_\_\_\_

**Arch: Pes Cavus:** (Scale 0-5) R \_\_\_\_\_ L \_\_\_\_\_ **Pes Planus:** R \_\_\_\_\_ L \_\_\_\_\_ **Hallux Valgus:** R \_\_\_\_\_ L \_\_\_\_\_

**Mortons Toe:** Y / N **Box Toe:** Y / N **Double Diamonds:** Y / N **IP Joint Position:** Subluxed Y / N

**Rearfoot Varus/Valgus:** Y / N **Intoe or Outtoe Haglunds:** \_\_\_\_\_

**Hammer Toes:** R L **Other Abnormalities:** \_\_\_\_\_

## **CALLUS FORMATION PLANTAR ASPECT:**

**R:** Sole \_\_\_\_\_ Heel: Medial Lateral Middle MT: 1 2 3 4 5 Notes \_\_\_\_\_

**L:** Sole \_\_\_\_\_ Heel: Medial Lateral Middle MT: 1 2 3 4 5 Notes \_\_\_\_\_

**PALPATION OF FOOT:** Rigid Flexible S/S Hypermobility: Y / N

Notes: \_\_\_\_\_

**Pain:** Y / N **Where:** \_\_\_\_\_

## **WORN SHOE EVALUATION:**

**Type:** Athletic Dress **Sole:** Slick Grippy **Heel rise:** Y / N **Rocker:** Front Rear

**Other:** Tight Loose **Where:** Laces Heel Toe \_\_\_\_\_ **Heel slip:** Y / N \_\_\_\_\_

**Location of Wear Points:** **MT:** Min Mod Severe **Heel:** Medial Lateral **Midsole Wear:** Min Mod Severe

Notes: \_\_\_\_\_

Image CXVII.



# Brannock Device<sup>®</sup> 100

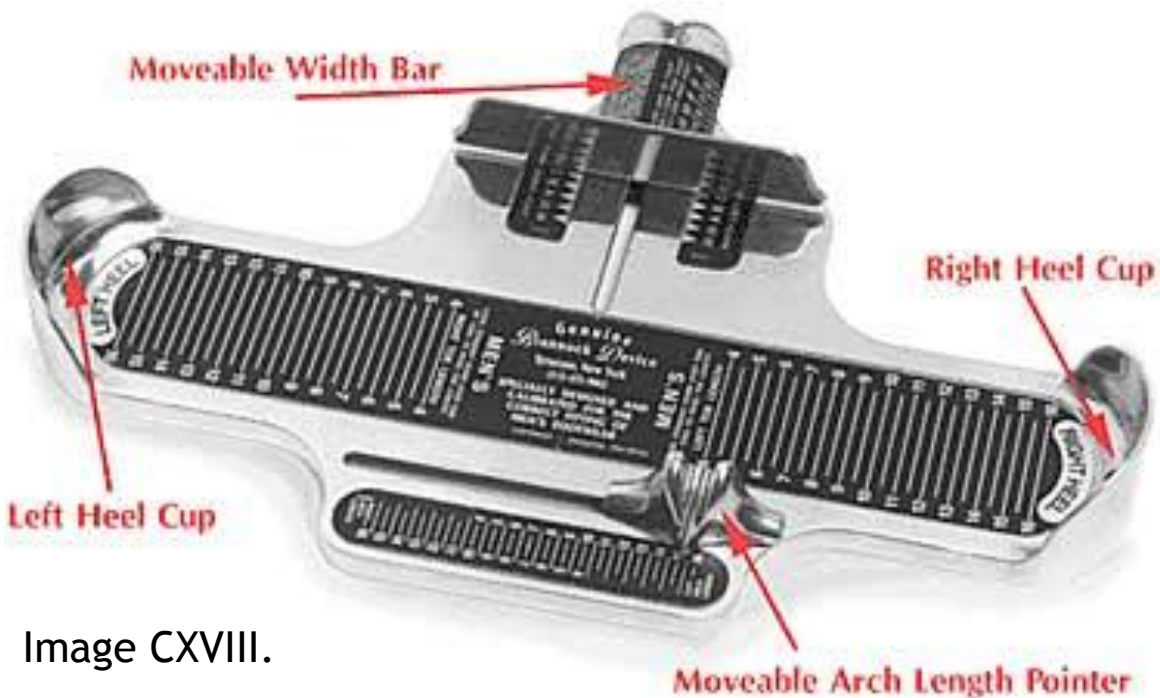


Image CXVIII.

- Fitting Instructions:*\*
1. Prepare the device
  2. Position the foot
  3. Measure Lengths  
Heel-To-Toe Length  
Arch Length
  4. Find the Correct  
Shoe Size
  5. Measure the Width
  6. Measure the Other  
Foot



Image CXIX.



# Brannock Device® Fitting<sup>100</sup>

1. Prepare device

2. Position foot

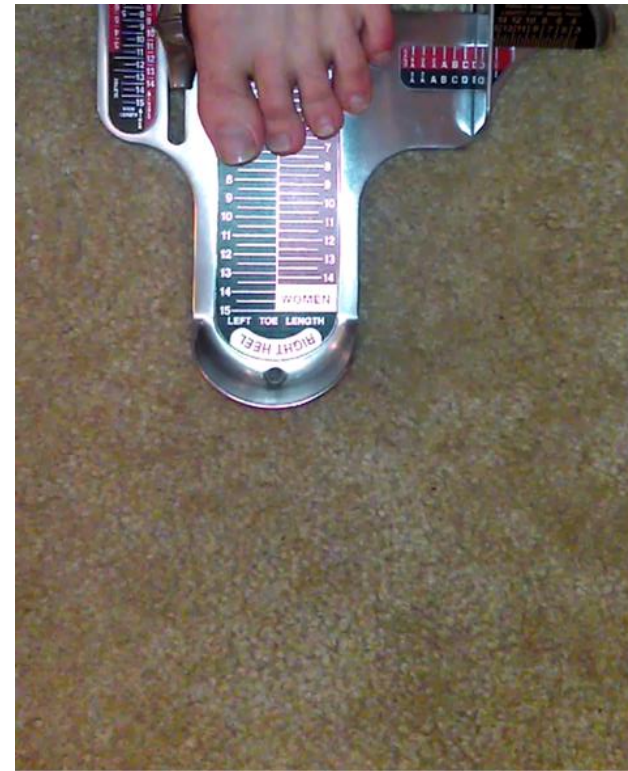


3a. Heel-To-Toe Length

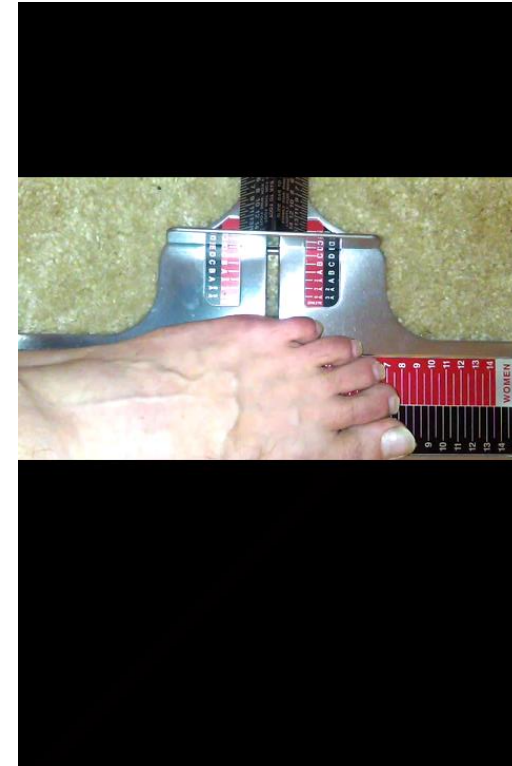
3b. Heel-To-Toe Length



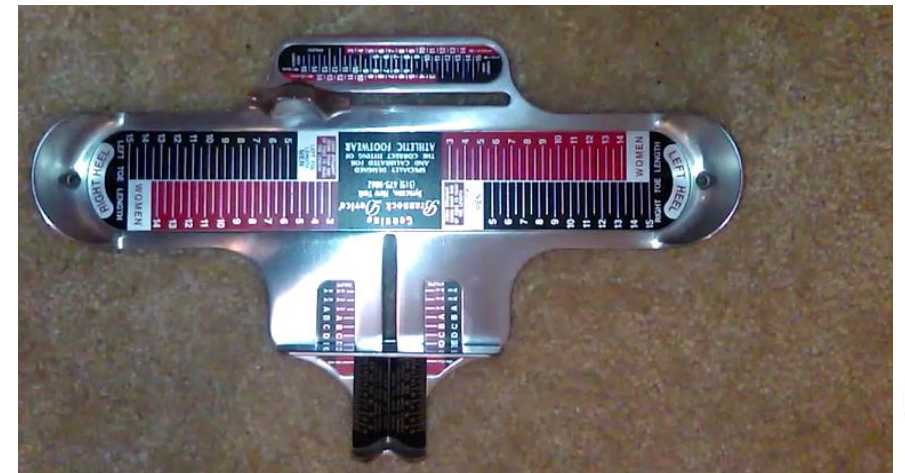
4. Find Correct Shoe Size



5. Measure Width



6. Measure Other Foot

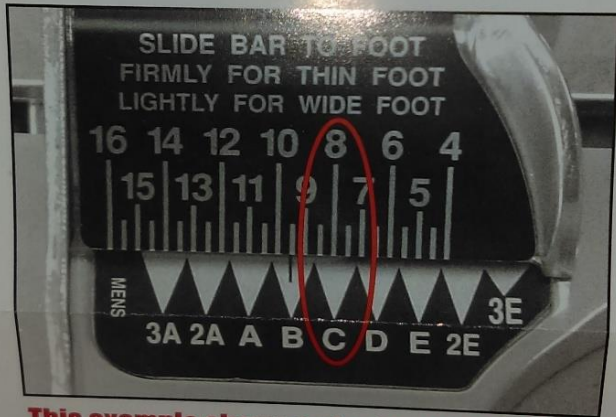


# Foot width & Brannock Device® sizes<sup>100-102</sup>

Brannock Device® Heel-to-Toe length, Arch length, & Foot width example:

**Example:**

Heel-to-Toe Measurement	Arch Measurement	Shoe Size
8	8	8
8	8 1/2	8 1/2
8 1/2	8	8 1/2



This example shows a size 8 with a C width.

Image CXX.

New Balance Shoe Width Table:

Image CXXI.

Men's Shoe Widths					
2A	B	D	2E	4E	6E
X-Narrow	Narrow	Standard	Wide	X-Wide	XX-Wide

Women's Shoe Widths					
4A	2A	B	D	2E	4E
X-Narrow	Narrow	Standard	Wide	X-Wide	XX-Wide

Image CXXII.



Wider foot width    Narrow foot width



# Summary of main points

- ▶ Appropriate footwear can reduce falls risk, promote continued independence, and improve quality of life for our clients.
- ▶ Nervous system, musculoskeletal, or comorbidity related conditions can influence the type of footwear a client should wear.
- ▶ Common foot deformities include hammer toes, heel spurs, hallux rigidus, and bunions.
- ▶ Remember that last shape, toe box size, counter and outer sole firmness, pitch and collar height, and base of support can influence a client's balance.
- ▶ For a shoe fitting remember to match foot shape, include prescribed shoe modifications, and consider other aspects that can influence use like ease of donning and doffing, comfort, and indoor or outdoor activity.



Image CXXIII.



# Utilize this resource!<sup>18</sup>

- ▶ Patient education
- ▶ Baseline of knowledge



Image CXXIV.



# Questions?

Contact **Vicki Mercer** with any questions you have!

Vicki Mercer PT, PhD: [vmercerc@med.unc.edu](mailto:vmercerc@med.unc.edu)



Image CXXV.



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