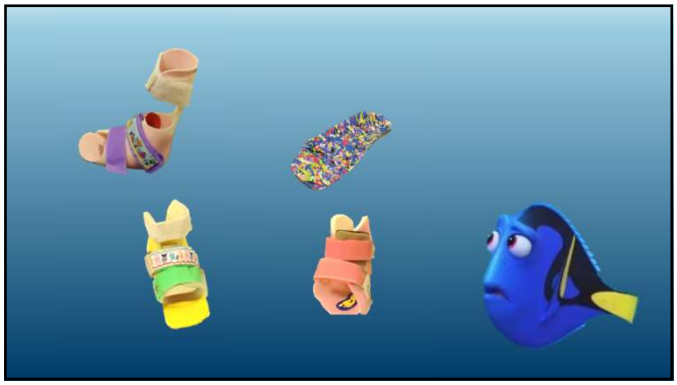
Intervention

- Range of motion
- Strength and motor control
- Neuroplasticity
- External supports



External Supports

Evidence based practice?

Why the difference in recommendations?

Challenges to EBP

- ICF Model
- Theories of Intervention
- Heterogeneity
- Terminology

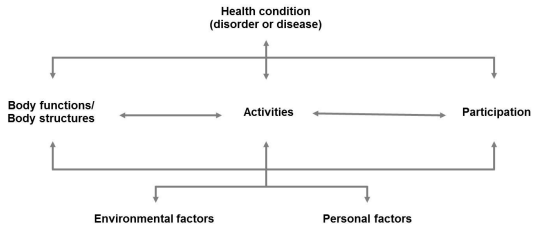
Evidence-Based Practice: Describe the perfect brace.

Marc Lawrence, Katie Ford, Caryn Lucas. Miss Congeniality. Warner Bros. Pictures, 2000.

Challenges to EBP:

What is your idea of the perfect brace?

Perfect Brace: ICF Model



World Health Organization. (2001). International classification of functioning, disability and health : ICF. World Health Organization.

Challenges to EBP: ICF Model

- Prioritizing Body Functions and Structures versus Activity and Participation may lead to different recommendations
- Each clinician filters the impact of Environmental and Personal Factors through the lens of their own values and experiences
- Use of a movement system approach can help to facilitate these complex conversations

Goals

Body Structure and Function

- Lessen the impact of cumulative micro-trauma due to sustained alignments or repeated movements
- Externally support hypermobile structures in the movement system which have become the path of least resistance for ground reaction forces
- Direct forces toward target structures to increase their relative flexibility

Goals

Body Structure and Function

- Restrict or resist motions in planes not compatible for healthy biomechanics
- Influence neuromuscular activation patterns during gait and other weightbearing activities

Goals

Activities

- Improve
  - Function
  - Efficiency
  - Safety

Goals

Environment

- Increase ***direct access*** to goal environments and structures

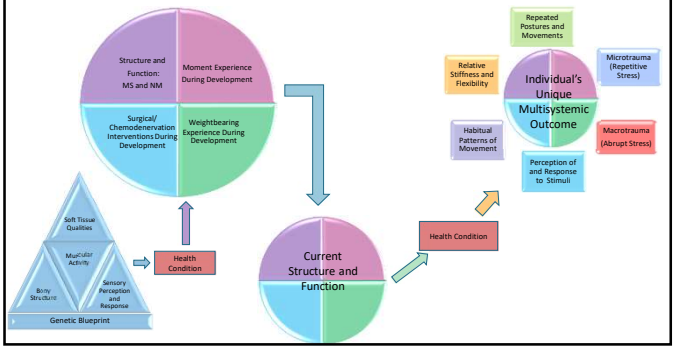
Goals

Participation & Personal Factors

- Social acceptance
- Self acceptance
- Fit in
- Stand out
- Appear neurotypical
- Celebrate differences
- Be cool

Which bracing option is most "effective"?

Developmental Movement System Model (DMSM)



Goals

Developmental Movement System Model

For the patient as an **adult**:

- Minimize negative sequelae of developing in the context of a pediatric health condition
- Minimize **pain**
- Maximize **structural resilience** of the movement system
- Maximize neuromotor function and **access to varied movement** options

Goals

Developmental Movement System Model

For the patient as an adult:

- Maximize the **environments and activities** the patient can access with their movement system
- Maximize **acceptance** of individual differences
- Maximize the ability to **self-advocate** and access appropriate resources
- Maximize work and social **engagement** as an adult

Challenges to EBP: "Efficacy" of Orthoses

What outcome does each study value?

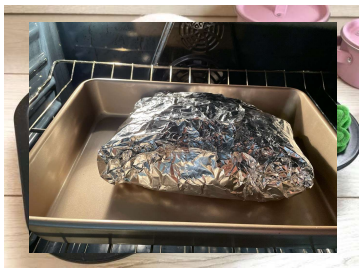
What level of the ICF are they focusing on?

Theories of Intervention

The Roast, the Parachute, and the One-Legged Stool

Theories of Intervention:

The Parable of the Roast



Challenges to EBP: Cultures of Intervention

The Parable of the Roast

- Rigidity
- Institutional practices
- Regional practices
- Health-condition based decision making
- Lack of flexibility
- Lack of clinical problem solving

Evidence-Based Practice

Challenges

1. Defining “effective”

Evidence-Based Practice

Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials. (Smith & Pell, BMJ 2003)

- Unable to identify any randomized controlled trials of parachute intervention.

- Conclusion: The perception that parachutes are a successful intervention is based largely on observation (anecdotal evidence).

Evidence-Based Practice

Systematic review for interventions for children with cerebral palsy.

Evidence-Based Practice
Outcomes: Cerebral Palsy

- Chronic conditions: higher rates of asthma, heart disease, stroke, emphysema, and arthritis
- Pain: **remarkably** higher prevalence of pain
  - 70% vs 20% in the general population
- Accelerated functional losses
- Lower levels of participation
- Emotional well-being: higher risk of depression and anxiety

van der Slot 2021, Peterson 2015, Smith 2018, Jacobson 2019, Frisch 2013

Evidence-Based Practice
Challenges

1. Defining “effective”
2. Cohorts (heterogeneity)

X intervention was effective for 60% of patients with Y health condition.

- What is the difference between the responders and non-responders?
- How do I know if my patient is similar to the 60% or the 40%?
- RCTs guide treatment for the “average” patient, but give little guidance for the individual patient

Evidence-Based Practice Challenges

1. Defining "effective"
2. Cohorts (heterogeneity)
3. Excluded patients
   - RCTs and systematic reviews exclude outliers:
     - Unique conditions
     - Unique combinations of conditions
     - Unique expressions of conditions
     - Unique personal factors impacting their condition
   - The clinician has little guidance for treating these individuals.

Challenges to EBP: Approaches to Intervention

Kaplan et al. Evaluating treatments in health care: The instability of a **one-legged stool**. *BMC Medical Research Methodology*. 2011;11(1):65.

Evaluating treatments in health care: The instability of a **one-legged stool**. Kaplan et al 2011.

Over-reliance on RCTs:

- has fostered a less critical form of thinking in the evaluation of health care treatments.
- has ***been influenced in part by market pressures relevant to pharmaceutical companies***
- was stimulated significantly by the 1962 amendments to the American Food, Drug, and Cosmetic Act
- is not scientifically sound

Evaluating treatments in health care: The instability of a **one-legged stool**. Kaplan et al 2011.

- What clinicians really want to know is whether or not the person sitting before them is likely to benefit.
- The averaged results derived from RCTs offer insufficient or even incorrect guidance on how to approach ***a specific case***.
- Additional forms of evidence that ***explicitly include*** individual and context characteristics are needed to assist clinicians in choosing a course of action regarding specific patients.

Evaluating treatments in health care: The instability of a **one-legged stool**. Kaplan et al 2011.

- Observational studies often include patients with coexisting illnesses and a wide spectrum of disease severity, which gives much more clinical information in determining treatment for the ***individual patient*** versus the ***average patient***.
- The premise that RCTs are the only form of evidence capable of providing an unbiased estimate of treatment effects is false.
- We must use critical thinking when designing and consuming studies, and know that RCTs are just one tool.

Challenges to EBP: Approaches to Intervention

Challenges to EBP: Heterogeneity

Krzak JJ, Corcos DM, Damiano DL, Graf A, Hedeker D, Smith PA, Harris GF. ***Kinematic foot types in youth with equinovarus secondary to hemiplegia.*** Gait Posture. 2015 Feb;41(2):402-8.

- Participants ***with hemiplegia and equinovarus*** fell between
  - **Five distinct subgroups -**
- Neurotypical controls were distributed among **4** of the subgroups
- Noted: **inherent variability even in neurotypical, asymptomatic movement systems**

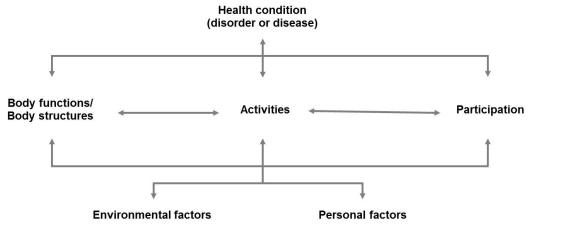
Challenges to EBP: Heterogeneity

Do glasses work for individuals with visual impairment?

Challenges to EBP: Heterogeneity

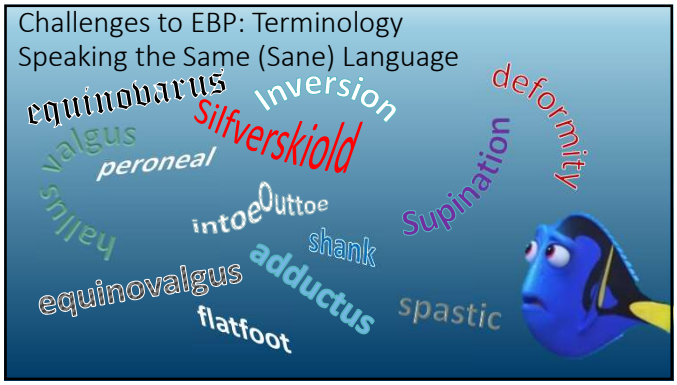
Are cohorts meaningful?

Challenges to EBP:
Meaningful Cohorts



World Health Organization. (2001). International classification of functioning, disability and health : ICF. World Health Organization.

Challenges to EBP: Terminology
Speaking the Same (Sane) Language



Challenges to EBP: Terminology
Inconsistency

Terminology of orthoses

External Supports

Evidence?

- Eddison M. Do research papers provide enough information on design and material used in ankle foot orthoses for children with cerebral palsy? A systematic review. Journal of children's orthopaedics. 2017;11(4):263-271.

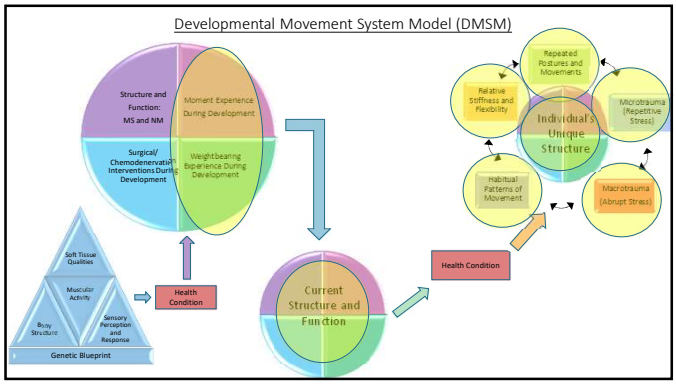
Building an orthotic decision-making framework

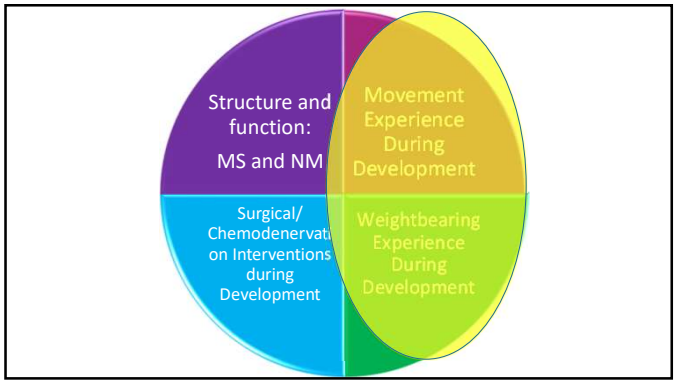
External Supports

- Targeted use of external support to guide adaptive tissue-specific stresses
- Adjuncts to joint mobilization/soft tissue interventions

External Supports

- Support for emerging neuromotor control
- Support for mass practice of motor skill
- Supporting repeated movements and sustained alignments that promote best possible structural development





Orthotic Intervention

Developmental Kinesiopathology

An orthoses can guide forces during repetitive movement and sustained alignments in order to:

- provide stress and strain that encourage tissues to form in a manner compatible with healthy movement patterns.
- reduce the system's tendency to experience microtrauma and macrotrauma in the future.
- provide mass practice of target motor patterns.

Orthotic "Prescription" versus "Design"

- Eddison M. Do research papers provide enough information on design and material used in ankle foot orthoses for children with cerebral palsy? A systematic review. Journal of children's orthopaedics. 2017;11(4):263-271.

Orthotic "Prescription" versus "Design"

Prescription: Capturing the individual characteristics of the movement system, including structural variants and support of compromised or at-risk structures

Design: Selection of brace features

Orthotic "Prescription" versus "Design"

- Prescription: helping the body interface with the world

Orthotic "Prescription"

- Developed from our Movement System Analysis
- This is a KEY ELEMENT of brace design, apart from style selection, and a key fault of ineffective orthoses.
  - If the style selected is correct, but the movement system has not been captured and supported specifically, the brace will not be appropriate.
  - Appropriate prescription may outweigh appropriate design.

Orthotic **Prescription**

❑ Structural Findings

What structural findings need to be captured in the device to allow the movement system to interface with the world?

Orthotic Prescription: Musculoskeletal Findings

- Developing the orthotic prescription

Musculoskeletal Findings

- ❑Structural variants
  - ❑Atypical structure
  - ❑TC Axis test: TC joint alignment
  - ❑Structural findings:

	Coronal Plane	Transverse Plane
Hip/femur		
Knee/tibia		
Hindfoot		
Midfoot		
Forefoot		

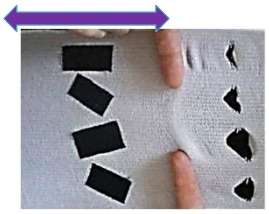
Orthotic **Prescription**: TC Axis Test

- ❑ Structural variants
  - ❑ Atypical structure
  - ❑ TC Axis test: TC joint alignment
  - ❑ Structural findings:

- Identifying the axis of the talo-crural joint
- Identifying structural variants

Orthotic **Prescription**

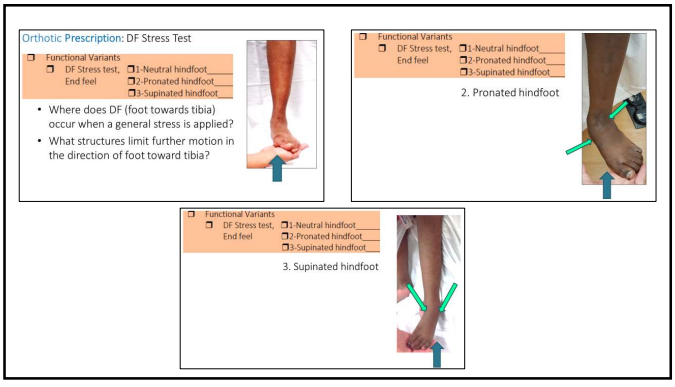
- ❑ Functional Findings
  - In what way does the system tend to move?
  - What structures need protection?
  - What structures need forces directed to them?



Musculoskeletal Findings

- ❑ Functional Variants
  - ❑ DF Stress test, End feel
  - ❑ Joint Function
- ❒ Neutral hindfoot
- ❒ Pronated hindfoot
- ❒ Supinated hindfoot

	Alignment, Joint Mobility, End feel, Arthrokinematics, ROM
Distal tib/fib	
Talo-crual	
Subtalar	
Midtarsals	
Forefoot	
Digits	



Orthotic Prescription: Musculoskeletal Findings

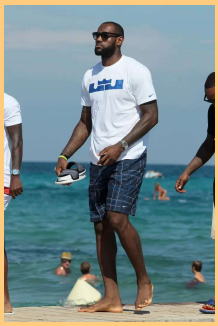
- Do all individuals with structural or functional variants need orthotics?

Structural Variants



Functional Variants

Functional Variants



Orthotic Prescription: Musculoskeletal Findings

- Joint Function
  - Maladaptive relative stiffness/flexibility
  - Altered line of pull of muscles around joints

Orthotic "Prescription" versus "Design"

Prescription: Capturing the individual characteristics of the movement system, including structural variants and support of compromised or at-risk structures

Design: Selection of brace features

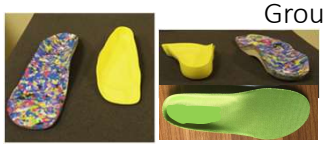
Orthotic Terminology

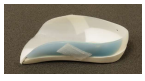
- Eddison M. Do research papers provide enough information on design and material used in ankle foot orthoses for children with cerebral palsy? A systematic review. Journal of children's orthopaedics. 2017;11(4):263-271.

Orthotic Design: Groups

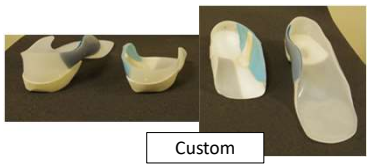
- Group 1: Foot Orthotics (FO)
- Group 2: Supra-Malleolar Orthotics (SMO)
- Group 2+: SMO+
- Group 3: AFO with Movement (AFO-M)
- Group 4: AFO – Solid (AFO-S)
- Group 4D: Solid with Dynamic Element
- Group 5: AFO – Sagittal Plane Only (AFO-Sag)

Group 1: Foot Orthotics (FOs)





Off The Shelf



Custom

Group 2: Supra-Malleolar Orthoses (SMOs)

Custom-from casts

Compression-from measurements

Group 2+: Supra-Malleolar Orthoses+ (SMO+)

Group 3: AFOs with Motion

Group 3: AFOs with Motion
Flexible Upright
(Posterior Leaf Spring)

Group 3: AFOs with Motion
Flexible Upright

Group 3: AFOs with Motion
Articulated

Free DF

DF Assist

Group 4: AFOs – Solid

Group 4: AFOs – Solid

Group 4D: AFOs – Solid With Dynamic Element

Group 5: AFOs – Sagittal Only
No Prescription

Anterior Shell

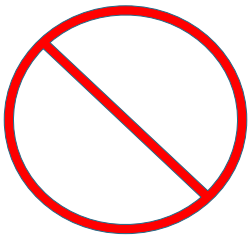
Posterior Shell

A/P
(+ false coronal)

Ravenclaw

- Questions about groups?

Rules: Remember the Roast!



Orthotic "Prescription" versus "Design"

Prescription: Capturing the individual characteristics of the movement system, including structural variants and support of compromised or at-risk structures

Design: Selection of brace features

Brace "Prescription" versus "Design"

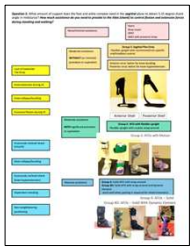
Prescription: Capturing the individual characteristics of the movement system, including structural variants and support of compromised or at-risk structures

Design: Selection of brace features

1. Coronal Plane
2. Sagittal Plane

Orthotic Design Charts: amandahallpt.com/resources

Orthotic Design:
Coronal Plane



Orthotic Design:
Sagittal Plane

Orthotic **Design: Coronal Plane**

- NWB Corrective Force

  What support is required to:

  Bring the foot and ankle in into position with the joints congruent?

Orthotic **Design: Coronal Plane**

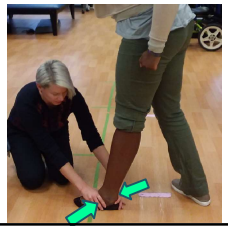
- WB Corrective Force Test

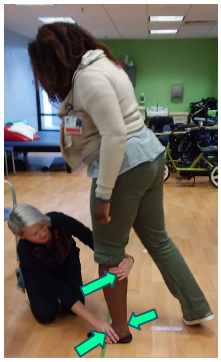
  What support is required to:

  correct alignment of hindfoot and midfoot in the frontal and transverse planes to ***allow dorsiflexion to occur primarily*** at the talocrural joint as the shank advances over the foot?

Orthotic **Design: Coronal Plane**

- WB Corrective Force Test





*Coronal Plane Chart
Orthotic Design: Coronal Plane

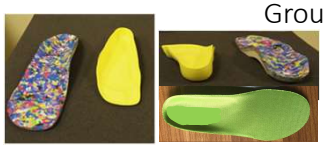
Support needed:
Cueing

Group 0

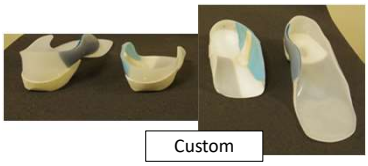
- No Intervention
- Monitor
- Stability and foot core training

Support at the calcaneous, medial longitunidal arch

Group 1: Foot Orthotics (FOs)



Off The Shelf



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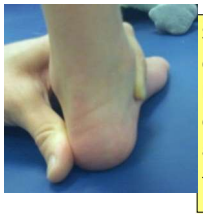
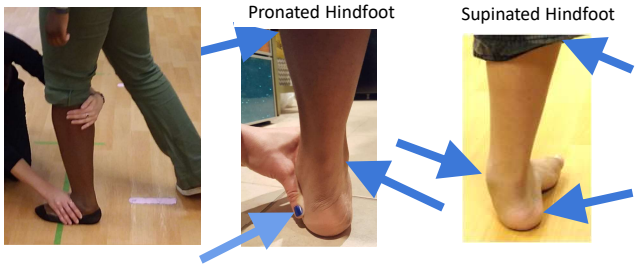


Support at the calcaneous, medial longitunidal arch, shaft of the 5th metatarsal and around the dorsum of the ankle

Group 2: Supra-Malleolar Orthoses (SMOs)
Group 2+: Supra-Malleolar Orthoses+ (SMO+)



Support at the calcaneous, medial longitunidal arch, shaft of the 5th metatarsal, around the dorsum of the ankle, at the tibia for a longer lever arm

Supinated Hindfoot

- Supinated posture

Group 3: AFOs with Motion

Group 5: AFOs – Sagittal Only

Anterior Shell | Posterior Shell | A/P (+ false coronal)

Triplanar support at the calcaneous, medial longitunidal arch, shaft of the 5th metatarsal, around the dorsum of the ankle, and around tibia

Group 4: AFO – Solid

Group 4: AFO – Solid

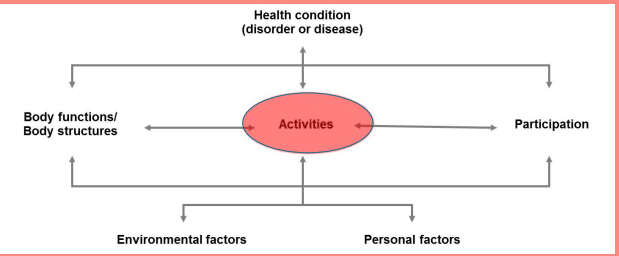
Brace “Prescription” versus “Design”

Prescription: Capturing the individual characteristics of the movement system, including structural variants and support of compromised or at-risk structures

Design: Selection of brace features

1. Coronal Plane
2. Sagittal Plane

Functional Status and Task analysis



Sagittal Plane Chart
Locomotor functions

- Propulsion
  - Advancement of the body over the supporting foot depends on stance limb mobility
- Shock absorption
- Stance stability
- Energy conservation

(Perry)

Orthotic Design: Sagittal Plane

❑Does not stand

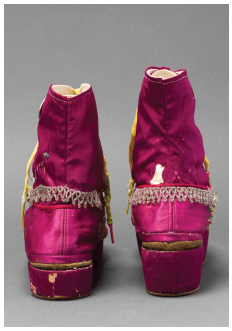
❑Stands but does not ambulate
- ❑With device (stander or gait trainer)
- ❑Stands for transfers or other function
- ❑Pre-ambulatory

What support is required to:

→Support the foot and ankle for safety, weightbearing, and the individual's activities?

Does Not Stand/Limited Standing

Group 0: No Orthotic



Does Not Stand/Limited Standing

Group 4: AFO – Solid

Orthotic Design: Sagittal Plane

❑Initial contact, loading response

What support is required to:

→Encourage knee flexion versus extension moment during loading response?

or

→Improve eccentric control of tibial advancement during loading response?

Loading Response

Group 1: Foot Orthotics (FOs)

Group 2: Supra-Malleolar Orthoses (SMOs)

Loading Response

Group 2+: Supra-Malleolar Orthoses+ (SMO+)

Loading Response

Group 3: AFOs with Motion

- DF Assist, DF Free



Loading Response

Group 3: AFOs with Motion

Posterior Leaf Spring - Assist in eccentric slowing of the shank

Loading response: Mechanical Assist to control GRF

Assisted Loading response

- Assist to dampen the impact of GRF through the kinetic chain
- Upright with dynamic element (PLS/PDE = Posterior Leaf Spring/Posterior Dynamic Element)

Loading Response

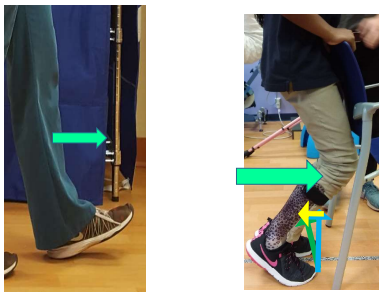
Group 4: AFOs – Solid

Stops progression of shank, chooses one angle and takes you straight there.

Loading Response

Group 4: AFOs – Solid

Stops progression of shank?



Loading Response:
Shank Reversal

Group 5: Sagittal Only AFOs

Anterior Shell

Posterior Shell

Loading Response:
Impaired Eccentric Control

Group 5: Sagittal Only AFOs

Anterior Shell

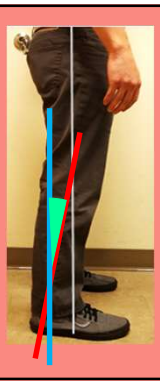
Posterior Shell

Orthotic Design: Sagittal Plane

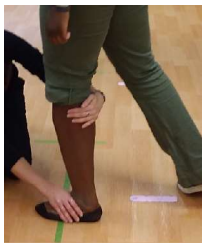
❑Midstance

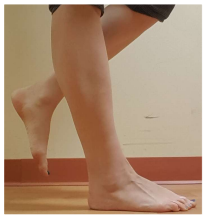
What support is required to:

- Obtain 5-15 degree shank angle in midstance/quiet standing?



Visual Inclinometry





- There *can* be 2 angles in an AFO:
  - Angle of the ankle in the orthosis
  - Angle of the shank (tibia) to the floor

❒**1-**Shank Angle WFL

Movement system is able to compensate for any changes at the foot/ankle

-or-

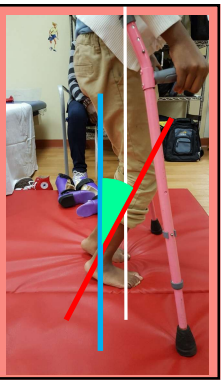
The greater movement system is ***driving*** the change in the foot/ankle

❑ 2-Excessively inclined shank (crouch)

Weight line

- anterior to hip
- posterior to the knee

Shank angle > 15 degrees



❑ 2-Excessively inclined shank (crouch)

Old conventional wisdom: set shank in a reclined angle angle to push the shank backwards. (“Floor reaction AFO”)

In reality, the foot has an inefficient lever arm for this to be effective, and the patient lifts the heel.

❑ 2-Excessively inclined shank (crouch)

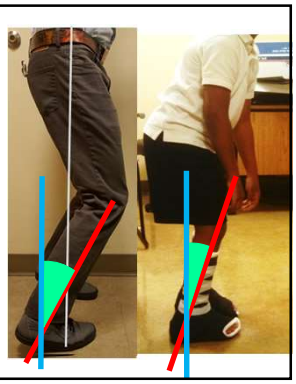
Current theory: Bring the floor up to the heel to provide:

- Heel contact at initial contact and midstance
- Provide a base for the thigh to move from reclined to inclined

❑ 2-Excessively inclined shank (crouch)

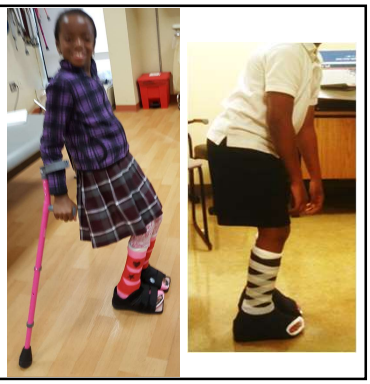
Begin to teach the motor system to load through the posterior aspect

Compromise towards the chosen shank angle to get heel contact



❑ 2-Excessively inclined shank (crouch)

- Gradually reduce the shank angle as posterior structures lengthen and motor learning occurs



Excessively Inclined Shank

Group 1: Foot Orthotics (FOs)
Group 2: Supra-Malleolar Orthoses (SMOs)
Group 2+: Supra-Malleolar Orthoses+ (SMO+)

Excessively Inclined Shank

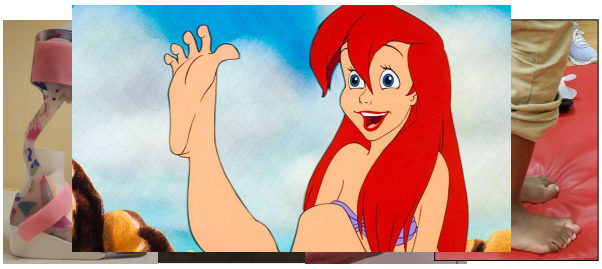
Group 3: AFOs with Motion

- DF Assist, DF Free

Excessively Inclined Shank

Group 3: AFOs with Motion

Posterior Leaf Spring



Midstance
Mechanical Assist to slow tibial progression

Assisted Midstance:

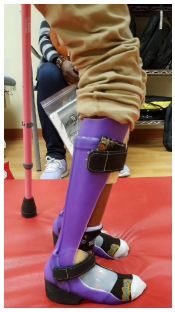
Dynamic Upright (Posterior Leaf Spring/ Posterior Dynamic Element)

1) Grade tibial progression
2) Stabilize the knee by slowing tibia motion relative to femur motion

Excessively Inclined Shank

Group 4: AFOs – Solid

Removes a degree of freedom—provides a stable base to work on proximal skills for standing and gait alignment.



Excessively Inclined Shank

Group 5: Sagittal Only AFOs

Anterior Shell

Posterior Shell

A/P
(+ false coronal)

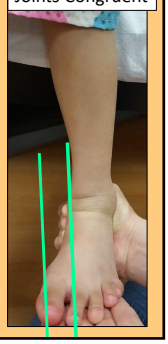
Ravenclaw

❒Structural Variants

	Coronal Plane	Transverse Plane
Midfoot	Metatatarus Varus	Metatarsus Adductus

Masked

Joints Congruent

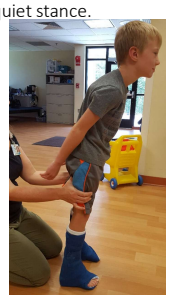




- 2-Excessively inclined shank (crouch)

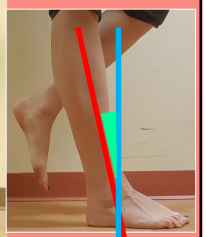
Treatment focuses on learning to bring the thigh from reclined to inclined over a stable base in midstance and quiet stance.

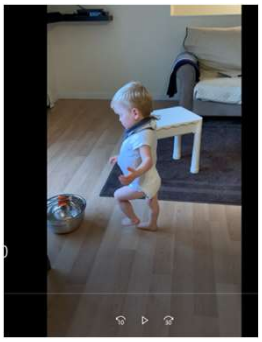




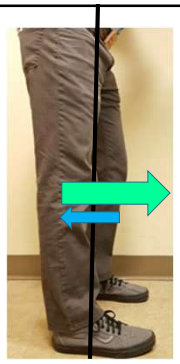
- 3-Excessively reclined shank (knee hyperextension)

Weight line
- anterior to hip
- anterior to the knee



- 3-Excessively reclined shank (knee hyperextension)
  - Goal: bring the shank angle forward enough to overcome the tendency for the system to create an extension moment.



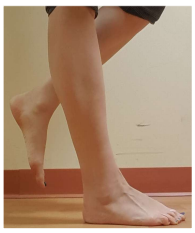
Excessively Reclined Shank

Group 2+: Supra-Malleolar Orthoses+ (SMO+)

Excessively Reclined Shank

Group 3: AFOs with Motion

- DF Assist, DF Free
- If set with a PF block, may overcome reclined shank moment while allowing the gastrocsoleus perform eccentric control of DF.



Excessively Reclined Shank

Group 3: AFOs with Motion

Posterior Leaf Spring

Excessively Reclined Shank

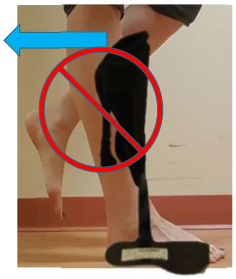
Group 4: AFOs – Solid

- Removes a degree of freedom—provides a stable base to work on proximal skills for standing and gait alignment.
- This stability may assist with motor learning to increase loading through the limb.

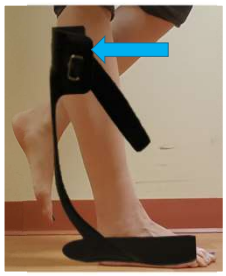
Excessively Reclined Shank

Group 5: Sagittal Only AFOs

Anterior Shell



Posterior Shell



Special cases

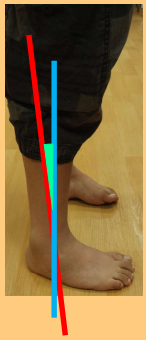
- Primary muscular weakness

❑ 3-Excessively reclined shank (knee hyperextension)

Weight line
- anterior to hip
- anterior to the knee

Musculoskeletal Findings

- ❑Altered muscle strength or endurance due to health condition
  - Weight line is aligned anterior to knee to maintain knee stability
  - Shank angle reclined
  - Forcing the shank forward will cause uncontrolled knee flexion (buckling) and loss of stability in standing



Excessively Reclined Shank + Primary lower extremity weakness

Group 4: AFO – Solid

Excessively Reclined Shank + Primary lower extremity weakness

Group 5: Sagittal Only AFOs

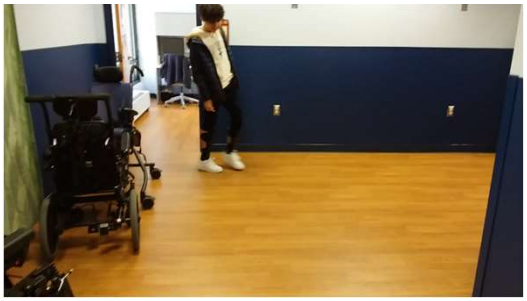
Anterior Shell

Posterior Shell

- “B”

Excessively Reclined Shank +
Primary lower extremity weakness

Excessively Reclined Shank +
Primary lower extremity weakness



- Terminal Stance
  3rd Rocker

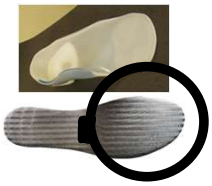
What support is required for:
→Heel contact
→with knee extension
and
→hip extension

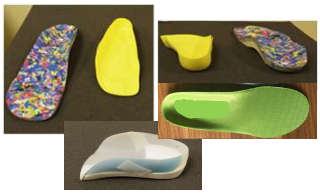
3rd Rocker

Group 1: Foot Orthotics (FOs)

Stiff 3rd rocker

Flexible or free 3rd rocker



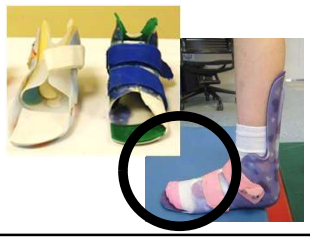


3rd Rocker

Group 2: Supra-Malleolar Orthoses (SMOs)
Group 2+: Supra-Malleolar Orthoses+ (SMO+)

Stiff 3rd rocker

Flexible or free 3rd rocker



Group 3: AFOs with Motion Flexible Upright

Group 3: AFOs with Motion Articulated

Free DF

DF Assist

- Terminal Stance
  4th Rocker

What support is required to:
→Store energy to assist with push-off
→Move from stance to swing efficiently?
→(Heel whip)

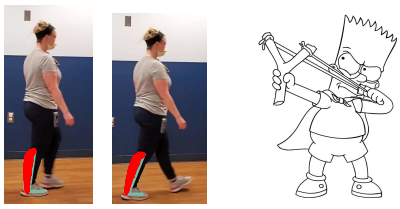
Energy Storage

Group 3: AFOs with Motion
Flexible Upright



Energy Storage





Mechanical Assist for “spring off”

Assisted terminal stance

- Upright with dynamic element (Posterior Leaf Spring/ Posterior Dynamic Element)

Energy Storage

Group 3: AFOs with Motion
rticulated

Free DF

DF Assist

Energy Storage

Group 4: AFOs – Solid

Posterior Leaf Spring/ Posterior Dynamic Element

Energy Storage

Group 5: Sagittal Only AFOs

Anterior Shell

Posterior Shell

A/P
(+ false coronal)

Functional Status and Task analysis

Swing phase
- ❑Foot clearance

What support is required for:
→Foot clearance

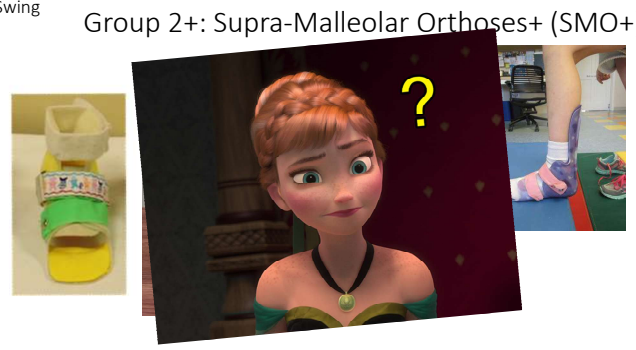
→Limb positioning at terminal stance

Swing

Group 1: Foot Orthotics (FOs)
Group 2: Supra-Malleolar Orthoses (SMOs)

Swing

Group 2+: Supra-Malleolar Orthoses+ (SMO+)



Swing

Group 3: AFOs with Motion
Flexible Upright



Swing

Group 3: AFOs with Motion
rticulated


Free DF

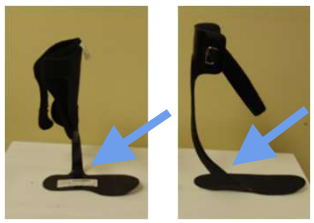

DF Assist

Group 4: AFOs – Solid



Swing

Group 5: Sagittal Only AFOs



2 points of control, depend on shoe for the 3rd.

Effective to support clearance and pre-positioning with
- Weakness
- Cueing

not against active resistance.

Functional Status and Task analysis

❑Transverse and Coronal Plane findings

Posting

Loading response:
Mechanical Assist to control GRF

Assisted Initial Contact at heel

- Heel contact is a vital sensory trigger to stimulate eccentric GS function
- Bring floor up to heel

Midstance:
Mechanical Assist for heel contact

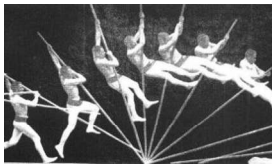
Assisted weightbearing through heel

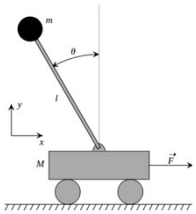
- Heel contact is a vital sensory trigger to stimulate eccentric GS function
- Heel contact mechanically stabilizes the calcaneus to allow for controlled tibial motion

Midstance:
Mechanical Assist for heel contact

Assisted weightbearing through heel

- Heel contact mechanically stabilizes the calcaneus to allow for controlled tibial motion





Inverted Pendulum

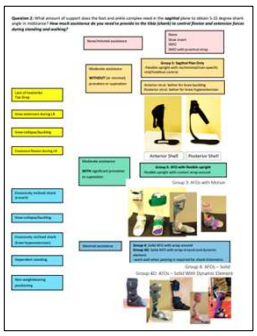
Midstance:

Mechanical Assist for heel contact

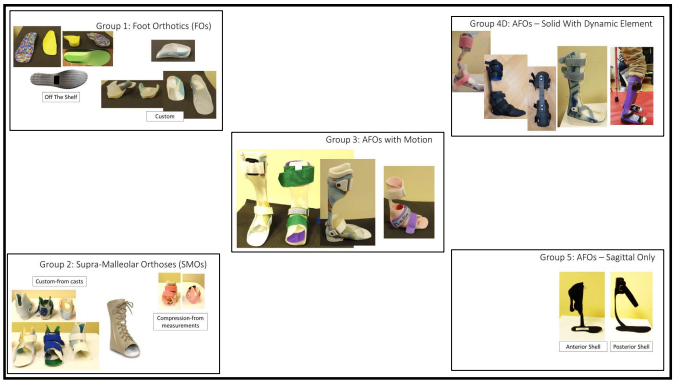
Assisted weightbearing through heel

- Heel contact is a vital sensory trigger to stimulate eccentric GS function
- Heel contact mechanically stabilizes the calcaneus to allow for controlled tibial motion
- Relative stiffness of the GS and ankle are common; posting the heel may decrease functional resistance to forward movement of the shank
- Bring floor up to heel

Coronal Plane

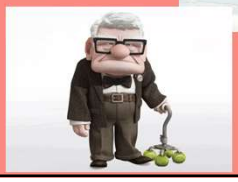


Sagittal Plane



Functional Status and Task analysis

- ***Lifespan*** Status
  Goals related to movement experiences based on current developmental status.



Lifespan Status

Older Adults

- Falls associated with:
  - Foot pain
  - Abducted 1st ray (Hallux valgus)
  - Lesser toe abduction/malalignment
  - Chronic midfoot pronation posture

Lifespan Status

Older Adults

- Foot problems are associated with:
  - Falls
  - Frailty level
  - Decreased motor performance

Lifespan Status

Older Adults

- Age-related changes
  - LE muscle strength and power
    - specifically great toe and ankle muscles
    - contribute decreases in balance and gait
  - Skin and soft tissue changes to the plantar surface
    - associated with:
      - decreased balance
      - increased fall risk

Fall Risk Reduction in Older Adults

- Safer with shoes at all times, even in the house, especially for people with diabetes.
- The lower the top of the shoe is, the less stability and input it provides.
- Orthotics can improve sensory and mechanoreceptor input.
- AFOs improve stability and sensory input to improve balance and reduce fall risk.

Orthotic Design: Neuromotor

- What external support is needed for mass practice of target motor skills?
- What external support decreases tonic contractions which lead to sustained alignments that would contribute to pathoanatomical changes?

→Foot and ankle
→Elsewhere in kinetic chain

Sensory Perception and Pain

Informs
- Orthotic design

What support is needed for the foot intrinsics to receive relevant balance information?

Relevant Systems

Informs
- Orthotic decision
- Orthotic design

Individual Characteristics

Informs
- Orthotic decision
- Orthotic design
- Orthotic aesthetics
- Orthotic dosage

Minimizing Negative Impacts of Orthotic Intervention on Activities and Participation

Individual Characteristics: Aesthetics

What are our beliefs around the rights of individuals with complex healthcare needs and:

- Fault
- Self Expression
- Autonomy
- Body boundaries

?

Individual Characteristics: Aesthetics

- Physical therapists have an ethical responsibility to support the autonomy of patients, especially those who may have decreased abilities to make choices in their lives and particularly to set boundaries around their bodies.
- We should avoid adding "insult to injury" with ugly orthoses.

Special cases

- Limited DF ROM
  - Stretching orthotics

Comprehensive Treatment Plan

- Consider the cost of removing a degree of freedom
- Bracing, even solid-ankle does not mean no other intervention to the foot and ankle
- We should always look for opportunities to mobilize, strengthen, and support motor learning
- Dosage can be key for multiple movement experiences

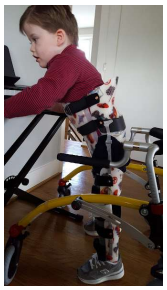
- Do you resist to strengthen or support/assist?

Comprehensive Treatment Plan

Orthotic Plan		
	Setting	Schedule
No Device		
Device 1		
Device 2		
Device 3		

Physical Therapy:
Home Program:
Community Exercise Activity:

- Going above the knee


- Ethics wheels versus walking