LESSON 4

Neuromuscular Pathology Treatment Options

biopods™

LESSON 4

Conventional Treatment Methods

(For more detailed coverage of this topic, refer to The Future of Foot Care monograph, pages 44-52.)

Palliative Treatment Methods

Examples of the least effective (in the long term) attempts to relieve presenting symptoms are the following (strictly palliative) means:

- Electrotherapy
- Compression wrap and braces
- Heat
- Ice
- Oral anti-inflammatories and analgesics
- Topical creams, ointments, and rubs

Therapeutic Treatment Methods

Therapeutic treatment methods, while a step up in the pursuit of symptom relief, often still do not alleviate the underlying causes of pathology. The following is a list of common therapeutic treatment methods:

- Acupuncture
- Chiropractic manipulation
- Corticosteroid injection
- Deep tissue massage
- Hands-on soft tissue mobilization
- Instrument assisted soft tissue mobilization
- Laser treatment
- Shockwave therapy
- Therapeutic ultrasound

Figure 4.1. Some common treatment methods.

Surgery

Perhaps the most aggressive treatment method for relieving symptoms is surgery to remove or alter the structures or tissues from which pain is emanating. It may be argued that, in the long term, this is the worst option of all because it alters essentially normal anatomy, potentially reducing the possibility of future, optimal rehabilitation.

All treatment methods will result in some symptomatic relief and, perhaps, even complete relief. However, without addressing the actual cause of the underlying maladaptive neuromusculoskeletal mechanics of a pathology, the ultimate long-term net outcome of any of these treatment methods will be future pain, suffering, degeneration, and ever-diminishing functional capacity.

Common Gait-Related Treatment Methods

The most common treatments for the host of pathologies that result from poor foot biomechanics focus on cushioning, supporting, or bracing the foot and ankle – often in combination. While exercise and rehabilitation programs are sometimes recommended, the focus is usually on the toe flexors as opposed to the toe extensors and compliance is usually poor.

Cushioning

Cushioning treatment options include foam, gel, and felt-based insole products, and footwear that incorporates cushioning midsoles. Cushioning often presents a "comfortable" feeling initially, but it provides a false sense of security by offering benefits that are superficial at best. In reality, cushioning spreads the ground contact forces to the sole of the foot over a wider surface area and optimal subtle varied stimulus becomes attenuated uniform stimulus.

Cushioning products are purported to dissipate the vertical shock that results from chronic overloading, thereby reducing the stress to the foot. Contrary to common perceptions, cushioning products mitigate vertical shock by less than 10%, at best. Unfortunately, studies show that horizontal forces – rather than vertical forces – contribute most significantly to foot pathologies. Research demonstrates that the control of initial pronation is of greater importance than shock absorption. Studies indicate that cushioning the foot isolates the plantar surface from the sensory feedback it requires to induce its protective adaptations – essential for effectively managing the forces generated at impact. It has been demonstrated, in vivo, that impact remains unchanged whether the runner uses soft running shoes, hard running shoes, or is barefoot (without a barefoot adaptation period).

Long-term use of cushioning products results in lower limb maladaptations – the loss of the neuromuscular system's functional robustness.

Supportive Orthotics (Bracing)

Custom orthotics and similar products attempt to stabilize the subtalar joint by supporting the arch, claiming to "correct" the poor biomechanics of the foot. This claim of correction is misleading. In reality, orthotics by their very nature, spread the ground contact forces to the sole of the foot over a wider surface area – optimal subtle varied stimulus becomes attenuated uniform stimulus.

Subtalar neutral position (the mechanical relationship between the talus and navicular) is often thought of as the key to proper structural alignment in the foot. Contrary to the conventional view, this mechanical relationship is dynamic in nature rather than static; that is, the relative positioning of the subtalar joint is determined by the nociceptive and proprioceptive reflex muscle activations (or lack thereof) in response to activity levels and terrain.

All too often, excessive pronation is incorrectly identified as the cause of these problems, when it has been demonstrated herein to be merely a clinical sign of inefficient nociceptive and proprioceptive reflex muscle activity. Orthotics mask these neuromuscular inefficiencies by artificially supporting or bracing the dysfunctional structure (or the structure that is exhibiting poor bone alignment) along with its inherent muscle imbalances, by simply introducing a new angle of ground interface to the foot.

In addition, by artificially supporting the foot, the orthotic manages the vertical loads in place of the arch system. As a result, over the long term, the arch system of the foot and the neuromuscular mechanics of the lower limb remodel in response, leading to a weakened structure and an increased dependency on the artificial support.

Exercise (Rehabilitation)

Exercise as a means of rehabilitation is a common therapy throughout musculoskeletal medicine. In fact, exercise, where appropriate, is usually the first treatment of choice, prior to more radical options, such as surgery. Many orthopedic surgeons recommend a regimen of exercise, both before and after surgery, as a means to speed recovery times. Mobility braces are commonly used after reconstructive ligament surgeries (i.e., at the knee) to reduce scar tissue formation and maintain mobility at the joint.

The most commonly recommended exercises for foot pathologies focus on rolling a ball or cylinder with the sole of the foot, plantarflexing the toes, or using them to grasp an object. These exercises may provide some benefit, but the muscular sequences involved have very little relevance to gait mechanics.

19 KEY TAKEAWAY

Current treatment methodologies are primarily focused on symptomatic relief and often are ineffective at addressing the cause of adverse maladaptive neuromusculoskeletal gait mechanics.

The most beneficial foot exercise would involve multidirectional barefoot activity on diversified terrain to enhance neuromuscular function and develop a balance of strength and flexibility throughout the lower limbs, hips, and back. However, this type of activity is impractical for most individuals.

Regardless of the exercises involved, the amount of time spent to achieve some positive benefit would be in direct proportion to the amount of time the person wore restrictive footwear. While exercise is promising for most individuals, it is limited by time constraints; hence, the typically poor compliance.

BioPods™ Technologies and Related Complementary Treatment Modalities: The New Gait-Related Paradigm

(For more detailed coverage of this topic, refer to The Future of Foot Care monograph, pages 52-85.)

The revolutionary premise of "foot rehabilitation" – capable of restoring an individual's maladapted neuromuscular gait mechanics (as found in the shod community) to optimally align and muscularly control gait mechanics (as found in the traditionally unshod community) – is the mission of BioPods technology.

To that end, Biopods, LLC, has developed a patent-pending Variable Reflex Technology (VRT™), which is incorporated into insole and footwear designs. Insole and footwear products incorporating VRT create the "Right Stimulus" and facilitate the "Right Movement" required for healthy barefoot-like (protective) neuromuscular response throughout the lower limbs, hips and back. This protective reflex response triggers the Windlass and Cuboid Pulley Effect mechanisms that are fundamental to the formation of a strong stable dome-like arch system. This dome-like arch system is the foundation for the safe and efficient lower limb kinetic chain "Right Movement."

20 KEY TAKEAWAY

When the soles of the feet receive "Right Stimulus" (disparate, variable stimulus) during the ground contact phase of gait, the protective reflex muscle activity required to create the "Optimal Arch Apex" is activated during swing phase of gait.

This protective reflex activity is a natural occurrence in unshod communities and is necessary for optimal foot, leg, hip, and back alignment/dynamic function.

This natural protective reflex can now be initiated in footwear by BioPods Stimsoles.

Clinical Concepts and Modalities

1. **Footwear design features that affect optimal foot mechanics**

   (a) Inner sole cushioning, for 'user comfort':

   i. dampens any possible stimulus to tactile, mechanoreceptive, proprioceptive, and pressure sensory input that would positively influence (i.e., stimulate) proper neuromusculoskeletal alignment of the foot

   ii. has been shown mathematically to create a net increase in the rate and severity of injury-causing forces experienced by the foot during weight bearing and propulsion

   iii. provides no 'useful' sensory input for central processing, and, perhaps worse

   iv. 'insulates' the nerves of the foot from detecting useful stimuli external to the shoe, via which optimal protective reflexes would otherwise be initiated, toward the creation of ideal foot alignment.

SOLUTION... footwear design that incorporates an inner sole with such an ideal firmness that it acts as an inert, neutral platform that provides the optimal metatarsal head-to-inner sole interface for maximally efficient propulsion. Introduce a 'variable' stimulus into the inner sole that will mimic the stimulus received by an unshod foot while walking on natural terrain.

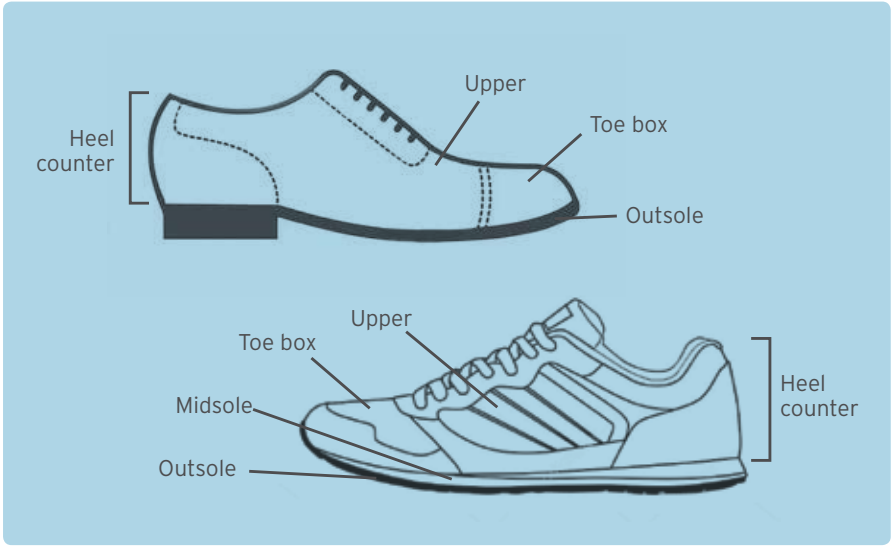


Figure 4.2. Footwear design characteristics.

(b) **Rigid outsoles constructed of hard and/or excessively thick materials**:

i. inhibit an efficient toe-off during propulsion via their rigidity
ii. attenuate varied ground contact stimulus
iii. inhibit the ideal sequence of adaptive heel-to-toe foot contact during the stance phase of gait
iv. create accelerated longitudinal heel contact to forefoot contact loading forces (i.e., "foot slap") and accelerated medial to lateral/lateral to medial loading forces during ground contact. These accelerated forces can be up to 400% greater than those experienced when barefoot. These increased forces create unnecessary strain and significantly increase the likelihood of injury.

SOLUTION... footwear design that incorporates soles capable of bending freely in every transverse plane, and that allow torsional positioning of the foot as it reacts to the stimulus of the previous stance phase

(c) **Hard rigid materials enclosing the toe boxes:**

i. prevent the adequate hallux extension necessary for the 'Windlass Effect' to have been effectively stimulated before heel strike, beginning the stance phase of gait
ii. prevent the adequate hallux extension necessary for ideal first ray configuration, thus hampering an efficient, linear toe-off for propulsion
iii. prevent the adequate hallux extension needed for the sesamoid bones to glide distal to the 1st metatarsal head point of ground contact. This is necessary for the 'locking-in-place' of the Windlass Effect required for the stability and alignment needed for optimal propulsion.

SOLUTION... footwear design that incorporates soft, non-restrictive materials above all the toes, but in particular, above the hallux

(d) **Narrow "pointy" toe boxes:**

i. compress all the metatarsal heads toward the foot's central axis, shifting the ideal vector of propulsion away from the first ray, diminishing the efficiency of propulsion and increasing tissue stress that can contribute to tissue injury

ii. prevent the adequate hallux extension needed for the sesamoid bones to glide distal to the hallux point of ground contact, necessary for the 'locking-in-place' of the Windlass Effect needed for optimal stability and alignment that create ideal propulsion, and minimizes the potential for tissue stress and injury.

SOLUTION... footwear design that incorporates a wide, roomy, deep toe box region

(e) **Widely flared heels (intended to 'stabilize' the foot at heel strike):**

i. prevent, or at least, inhibit the capacity of the calcaneus to roll, at heel contact, which is needed to most correctly react to the encountered terrain as sensed at the previous stance phase

ii. create a pivot point, other than at the center of mass of the calcaneus, that creates an inappropriate lever arm, thus generating abnormal stress that increases the risk of tissue overload.

SOLUTION... footwear design that incorporates outsoles that have the plantar surface of the heel region curved convexly (without any medial or lateral 'flare') to most closely match the natural, convex curve of the calcaneus. This minimizes the length of the lever arm so that, at the point of ground contact, there is an efficient and easy adaptability to the muscle stimulation that resulted from the terrain and activity level sensed during the previous stance phase of gait.

(f) **Uppers constructed with excessively rigid materials:**

i. prevent, or at least, inhibit torsional adaptive foot alignment relative to the stimulus received from the previous heel strike, regarding environment, terrain, and angles of activity

ii. prevent, or at least, inhibit the optimal skeletal alignment for the Windlass Effect and the glide of the sesamoid bones past the hallux point of ground contact, needed for optimal propulsion and minimized tissue stress

iii. prevent the peroneii muscles from efficiently exerting their 'pulley-like' effect through the Cuboid, thus inhibiting the formation of the 'optimal arch apex'.

SOLUTION... footwear design that incorporates uppers constructed of materials with sufficient suppleness and malleability so as to not hinder any degree of motion or alignment adaptations the foot may require as it responds to the stimulus from the previous stance phase

(g) **Excessive Heel Height:**

i. creates a position of plantar flexion that, beyond a tolerable minimal amount, makes it difficult to achieve sufficient dorsiflexion during swing phase to effectively create the Windlass Effect, leading to an unstable foot alignment in stance phase

ii. at the extreme (i.e., stilettos), causes the body's center of gravity to shift, ankles to become overly plantar-flexed, and knees to become hyper-extended – which creates multiple regions of abnormal tissue strain.

SOLUTION... footwear design that incorporates minimal heel height

21 KEY TAKEAWAY

Ideal footwear construction should incorporate:

- Maximally flexible outersole, capable of considerable torsion and easy dorsiflexion (uniformly, throughout the entire forefoot)
- Uniformly firm and dense innersole
- Rounded heel of minimal height
- Deep, roomy, broadly shaped toebox
- Supple uppers (materials and or construction)

These characteristics create an environment that optimizes "Right Movement," as initiated by the "Right Stimulus" of the contralateral foot, during the ground contact phase of gait.

2. Soft tissue treatment options

i. **Arch Supports –** as an attempt to passively create the 'fallen' or diminished foot arch – limits movement of the foot causing atrophy and weakening of the boney and soft tissues

ii. **Chiropractic Manipulative treatment –** is a form of manual treatment to influence joint and neurophysiological function, such as: improve joint biomechanics, improve joint neurological input and output, break up joint and soft tissue adhesions, reduce swelling with increased joint motion, etc.

iii. **Cushioned Insoles –** as a means to absorb forces, construed to be the cause of tissue symptoms – causes atrophy and weakening of the boney and soft tissues

iv. **Custom and Contoured Insoles** – as an attempt to improve foot function with a presumed ideal, preconfigured shape – limits movement of the foot causing atrophy and weakening of the boney and soft tissues

v. **Exercise Therapy –** as an attempt to lengthen contractured muscles, restore contractility to and strengthen wasted muscles and otherwise mobilize all soft issues in a currently maladapted region

vi. **Heat Therapy –** as an attempt to temporarily increase blood flow to the symptomatic region such that oxygen and healing nutrients can flood the damaged tissues

vii. **Ice Therapy –** as an attempt to temporarily reduce blood flow to the symptomatic region as a means to diminish inflammation and swelling, also as an attempt to create a concurrent analgesic benefit

viii. **Immobilization –** external braces, tensor wraps, and taping are used as a means to 'stabilize' the symptomatic areas – causes atrophy and weakening of the boney and soft tissues

ix. **Instrument assisted soft tissue mobilization** – as an attempt to break down adhesions and scar tissue (via the application of an instrument and precise body movements and specific tension, applied to the problem tissue), in essence, to "free up" proper tissue motion, elasticity, and contractility of muscles, tendons, and ligaments

x. Medication – (i) as an attempt to prevent, or reduce, the inflammatory response produced by tissues that naturally occurs following trauma or concurrent to an RSI process; (ii) as an attempt to inhibit the brain's perception of nociceptive input... in essence 'masking' the ongoing damaging process' warning signal, potentially risking further damaging activity, unabated

xi. Topical Ointments and Creams – a wide variety is available, as an attempt to offer ice benefits, heat benefits, healing compound benefits, and direct nutrient benefits

xii. Ultrasound, Shock-Wave, and Laser Therapies – as an attempt to eliminate the fibrotic build up and adhesions from symptomatic tissues; also as an attempt to stimulate/increase the rate of tissue healing

3. Assessment protocols: How to identify those who will benefit from BioPods

Q: "Who will benefit from the use of BioPods Technology?"
A: "Everyone who walks on two feet and wears shoes."

a) Clinical Indications of Maladapted Gait Mechanics

I. Visual Signs: [a.k.a.: (+) Foot Dysfunction Indicators (FDI)]

1. Bunions
2. Bunionettes
3. Callus & corns
4. Hammer Toes
5. Claw Toes
6. "Flat" Feet
7. Pes Cavus (excessively high arch)
8. Genu Valgus
9. Genu Varus
10. "Pigeon-Toed"
11. Hallux Valgus
12. External Hip Rotation
13. Forefoot Splay
14. Longitudinal Toe Rotation
15. Overlapping Toes
16. Loss of Toe Gaps
17. Misaligned Subtalar Joint Alignment
18. Pronated Forefoot with Inverted Calcaneus
19. Supinated Forefoot with Everted Calcaneus
20. Everted Calcaneus
21. Inverted Calcaneus
22. Bony Protuberances of the Foot (multiple sites possible)
23. High Iliac Crest
24. Pelvic Torsion
25. "Pump Bumps"
26. Fifth Toe "Flail"
27. Excessive Ankle Plantar flexion (when non-weight-bearing)

II. Nontraumatic Complaints of:

1. Toe Pain
2. Heel Pain
3. Ankle Pain
4. Shin 'Splints'
5. Peripatellar Knee Pain
6. Metatarsal Heads Pain
7. Achilles Tendon Pain
8. Hip Flexor Pain
9. Buttocks Pain
10. Lateral Knee Pain (fibula ligaments and ITB insertion)
11. Posterior Knee Pain (at hamstring tendon insertions)
12. Morton's Neuroma
13. Tarsal Tunnel Syndrome
14. Low Back Pain (including those with radiated pain to knee level)
15. Lateral Thigh Pain (ITB)
16. Trochanteric Bursitis
17. 'Sciatic' Leg Pain
18. Sesamoiditis

III. Recurrent Symptoms from Previous Trauma:

1. Recurring Hamstring Pulls
2. Recurring Groin Pulls
3. Recurring Quadriceps Strains
4. Recurring Ankle Sprains
5. Episodic Low Back Pain
6. Recurring Hip Flexor Pulls
7. Episodic Limping Gait

IV. Discovery by Palpation:

1. Intertarsal Muscle Fibrosis
2. Shin Muscle/Fascia Fibrotic 'Lumps'
3. Tender Achilles Tendon
4. Tender Fibrotic Regions within the Peroneii (Fibularis), Flexor Hallucis Longus, Tibialis Anterior or Posterior Muscle
5. Tender Fibrotic Regions within the Plantar Fascia
6. Tender Fibrotic Regions of the Tibialis Anterior, Peroneus (Fibularis) Longus, or Peroneus (Fibularis) Brevis Insertion Points
7. Joint Fixations within the Foot and Ankle

The presence, history, detection, or palpation of any of the above represents a positive indication for the use of BioPods Technology as a means to correct the maladaptive neuromusculoskeletal gait mechanics that are responsible for the development of each of these observations/findings.

22 KEY TAKEAWAY

We see BioPods technologies as an actual panacea for the treatment of virtually all nontraumatic lower limb conditions of:

- Pain
- Degeneration
- Maladapted tissue
- Dysfunction

All due to a maladapted mechanical gait pattern (as the singular cause)–as found consistently in the shod community.

V. Other Possibilities:

1. Diabetic Patients
2. Fibromyalgia Patients
3. Post-surgical Rehab Patients (regarding the lower limb)
4. Incomplete Recovery from Surgery or Injury (for lower limb)
5. Children (to promote optimal foot function, during growth, that leads to an optimal 'environment' for ideal bone development and antagonistic muscle balance)

How to Select the Optimal BioPods Stimulus Intensity Level

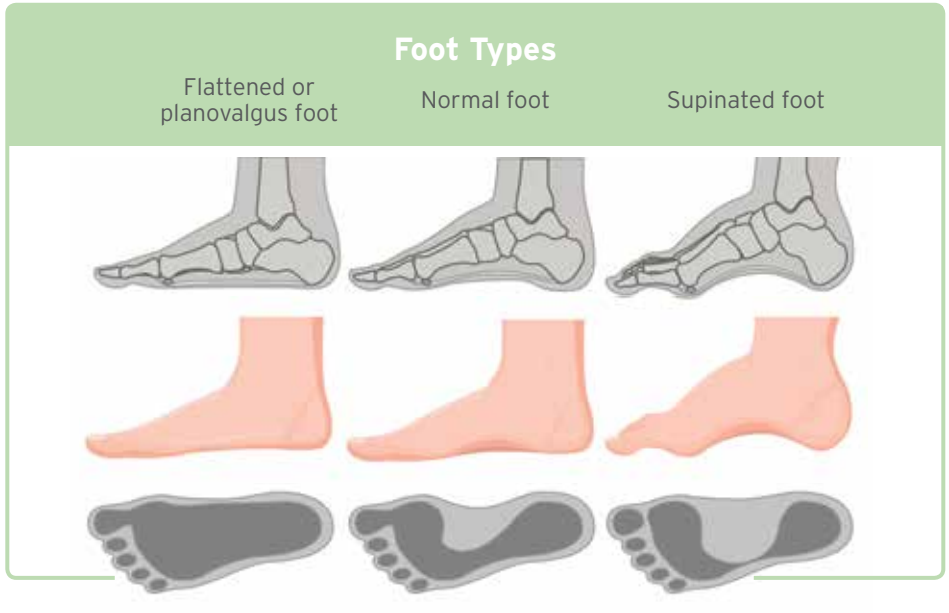


Figure 4.3. Three foot types. Each type can be regarded functionally as either rigid (difficult hallux elevation) or mobile and each will be best suited to a specific stimulus intensity level.

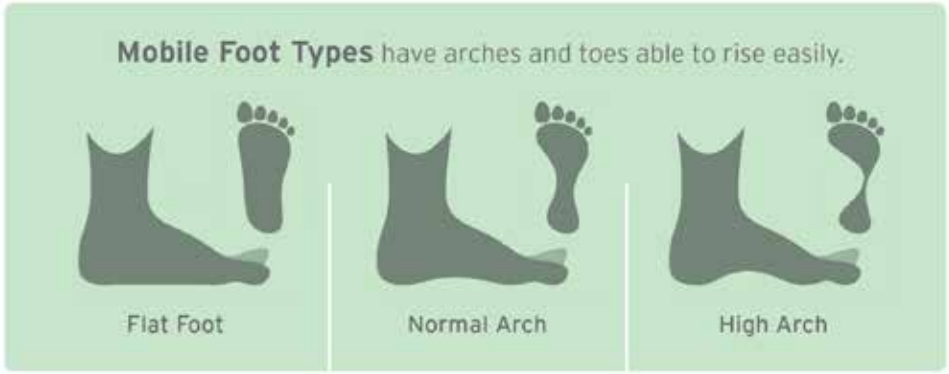


Figure 4.4. Mobile foot types: The toes and arches are able to rise easily.

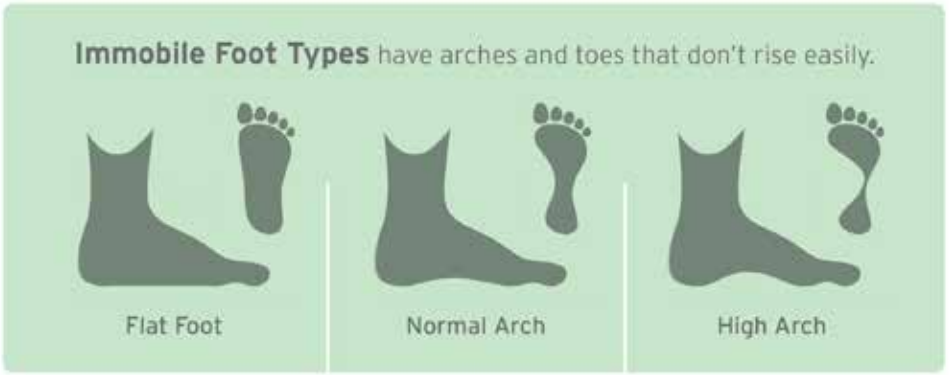


Figure 4.5. Immobile foot types: The toes and arches are unable to rise easily.

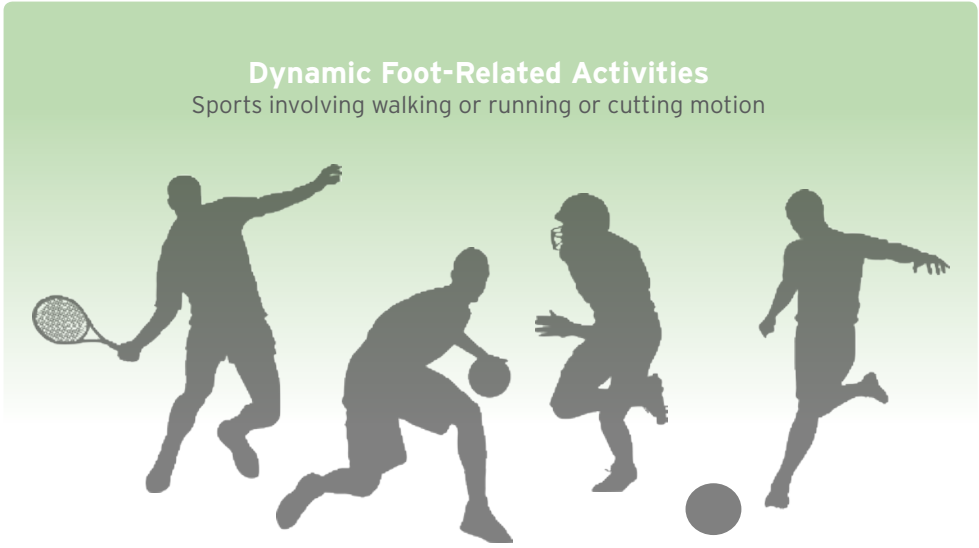
Absolute contraindication for BioPods implementation: Hallux rigidus (complete immobilization of the hallux of any cause – genetic, arthritic, traumatic, or surgical).

b) Habitual Footwear Use and Activity-Related Parameters

BioPods Stimsoles are available in three stimulus intensity levels. Typically, when initially using BioPods Stimsoles, the optimal Pods VRT level is determined, first, by the stimulus most suitable for specific foot types (see Figures 4.4 and 4.5). VRT 300 Pods provide the most aggressive stimulus (best for higher-intensity "Dynamic Foot-Related Activities" in loose-fitting, flexible footwear). VRT 200 Pods provide a moderate degree of stimulus (best suited to everyday use in loose-fitting, flexible footwear). VRT 100 Pods provide the least aggressive stimulus (best used or standing or lower-intensity activities and for tight-fitting footwear). Lower stimulus intensities are also preferred for "Static Foot-Related Activities" in tighter fitting footwear.

Over time, regardless of the Pods used, the stimulus intensity will increase subtly as the insole body's EVA foam compacts slightly (approximately 1 mm) around the Pods, which do not compact.

Dynamic Foot-Related Activities:
Sports involving walking or running or cutting motion (e.g., soccer, baseball, basketball, tennis, football).



Static Foot-Related Activities: Sports in which the foot functions strictly as a lever (e.g., waterskiing, cycling, snow skiing, rowing, skating).

Dynamic and Static Blended Activities: Activities requiring prolonged standing and moderate amounts of walking (e.g., retail sales jobs, warehouse workers, cashiers, production line workers, hospital workers).

4. Conservative Treatment Modalities

a) Overall Concepts

The singular intent of BioPods Technologies is Foot-Related Function Rehabilitation. This intent implies that the optimal rehabilitation of all weight bearing mechanics and the entire kinetic chain that rely on optimal foot function will follow. True rehabilitation (to be equivalent to the approach taken regarding every other body region) cannot be achieved via palliative treatment (i.e., simply providing comfort) modalities.

23 KEY TAKEAWAY

The optimal BioPods Stimsole selection will be determined using several criteria foot type and mobility capacity, activity levels, style of intended footwear. and components of construction and/or materials within the footwear to be used.

The use of specific-purpose, therapeutic measures is necessary for true rehabilitation. From the table below, it is apparent that 4 therapeutic options are implicated as components of a truly effective foot (and related gait issues) rehabilitation program.

i) Table of Treatment Options

TREATMENT	TYPE	EXAMPLES
Pain Control and/or Anti-inflammatory	Palliative	Ice, Heat, Acupuncture, Oral Medication, Electrotherapy, Topical Creams/Rubs
Passive Alignment Control/Stability	Palliative	Tensor Wrap, Brace, Supports, Orthotics
Surgery	Palliative	————
Corticosteroid Injection	Pall/Therap	————
Specific Exercises	Pall/Therap	Stretch, Strengthen, Coordinate, Balance
Non-instrument assisted soft tissue manipulation	Therapeutic	FAKTR (Functional And Kinetic Treatment with Rehab)
Damaged Tissue Breakdown	Therapeutic	Ultrasound, Laser, Active Release Technique (ART), Graston, Shock Wave Therapy
Joint Manipulation	Therapeutic	Chiropractic Treatment
Stimulated Alignment Control	Therapeutic	BioPods Technologies

ii. Factors Affecting the Treatment Plan and Prognosis

Assuming constant use of BioPods Technologies during all weight bearing activities

1. **Age:**
   (a) [< 20 yrs: BioPods effect is quick and easy; for damaged tissue, Rx~4 sessions]
   (b) [20-40 yrs: BioPods effect is 1 weeks; for damaged tissue, Rx~6-8 sessions]
   (c) [40-60 yrs: BioPods effect is 2 weeks; for damaged tissue, Rx~8 sessions]
   (d) [> 60 yrs: BioPods effect is 3-4 weeks; for damaged tissue, Rx~8 –many sessions]

2. **General Health:**
   (a) Poor nutritional status: Results in a slower rate of tissue healing whether from adapting to BioPods stimulus or emergence of latent tissue damage revealed by adaptation to BioPods
   (b) Diabetic patient: If a long history, or severe symptoms, it will result in a much slower rate of tissue healing; if secondary therapy is needed, adaptation to the BioPods stimulus may be (but not necessarily) slower
   (c) Poor fitness level: No effect on rate of adaptation to the BioPods stimulus; low fitness usually shows slower rate of response when secondary therapy is needed
   (d) Neurologic disorders: The presence of MS, ALS, Parkinson's, etc., unpredictable outcomes; neuropathy often has rapid, efficient adaptation to BioPods stimulus (but max results are usually not expected); response to tissue therapy, when it has become needed, can be prolonged

3. **History of Significant Lower Limb Trauma:**
   (a) Knee instability (due to traumatic ligament damage): The BioPods stimulus cannot stabilize the loss of internal knee ligaments, but will create optimal alignment, thus decreasing prior degenerative patterns

(b) Fused hallux (via surgery, advanced arthritis or congenital): This condition predictably shows the poorest response to BioPods stimulus; without the Windlass Effect foot rehab cannot occur

(c) Recurrent ankle sprains: The response to BioPods is usually excellent but, depending on the amount and severity of lateral ankle ligament and tendon damage present, much secondary therapy may be needed

(d) Fractures: If healing has occurred with perfect bone alignment there is a minimum of, or nil, tissue damage to rehab; but often, and especially if bone has healed with poor alignment, there can be secondary tissue damage to repair; if a femur, tibia, or fibula has healed "short," a heel lift may be needed beneath the BioPods insole for optimal rehab

(e) Achilles tendon rupture/repair: If optimal length has been surgically restored, there is usually no complication to ideal adaptation to the BioPods

(f) Torn hamstring: A belly tear may, or may not, require secondary tissue therapy to adapt to BioPods stimulus; however, tears at either of the insertion regions usually require secondary therapy to accommodate the (usual) shift in knee alignment that accompanies kinetic chain rehabilitation, via BioPods stimulus

(g) Myositis ossificans: The difficulty in alleviating this condition does not, typically, interfere with the BioPods rehabilitation

4. **Daily Activity Levels:**

(a) Running sport athletes: The high performance demands of such individuals implies a very high likelihood of the emergence of even tiny pre-existing sites of tissue damage, via the BioPods adaptation process

(b) Weight bearing fitness participants will have a slight increased likelihood of emergence of pre-existing tissue damage, via the BioPods adaptation process

(c) Jobs requiring constant weight bearing: The likelihood of latent symptom emergence, via BioPods use, is moderate

(d) Jobs requiring constant sitting: The likelihood of latent symptom emergence, via BioPods use, is minimal

(e) Weekend warriors will often show dramatic inflamed aggravations of their pre-existing tissue damage sites during adaptations to the BioPods insoles

All the above generalizations are magnified (for the worse), for those who utilize the BioPods Technologies only intermittently during their weight bearing activities

b) Common Sites of Presenting Symptoms, Emerging Symptoms, their Pathomechanics and the BioPods Treatment Methodologies

The following table justifies the description of BioPods Technologies as a panacea (i.e., the dysfunctional foot, as per the previous discussion, is the singular basis for each emerging, or already symptomatic, site of tissue damage)

Diagnosis of Current Sx, or Rx-Program – Emerging Sx	Diagnosis Made via (FDI = Foot Dysfunction Indicator)	Tissue Specific Pathomechanics, via Gait and/or Footwear (RSI = Repetitive Strain Injury)	Treatment/Therapy
Intertarsal Muscle Fibrosis	Site Pain/ Confirm Tissue Palp/Correlate (+) FDI	Compression/Friction in Narrow Toe box with Inhibited Windlass Effect	Utilize BioPods Tech/Use footwear with greater toe box room/flexibility/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Tarsal Tunnel Syndrome	Radiated Sx/Site Pain/ Correlate (+) FDI	Rigid Footwear Upper Material/Talus Pronation Friction on & Strain of FHL & TP Tendons	Utilize BioPods Tech/Employ Flexible Footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Metatarsalgia	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Prolonged use of cushioning under the forefoot/Concave footwear supporting surface under metatarsals/Compression of Inner-sole, with Shallow Toe Box & Inhibited Windlass Effect	Utilize BioPods Tech/Use footwear with flexible yet firm flat supporting surface under metatarsals/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional

Diagnosis of Current Sx, or Rx-Program – Emerging Sx	Diagnosis Made via (FDI = Foot Dysfunction Indicator)	Tissue Specific Pathomechanics, via Gait and/or Footwear (RSI = Repetitive Strain Injury)	Treatment/Therapy
Plantar Fasciitis	Heel Pain at Calcaneus/ Correlate (+) FDI	Ineffective Windlass – Lengthened Plantar Tissues – RSI at PF Insertion on Calcaneus	Utilize BioPods Tech/ Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Fibrosis of Tib Ant & Per Long Insertion Point	Arch Pain/Confirm with Tissue Palpation/ Correlate (+) FDI	Lack of "Right Stimulus" – Inefficient Nerve Signals – Unbalanced 'Pulls' of Antagonistic Muscles – RSI	Utilize BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
AbHallLong Muscle Fibrosis	Pain at Medial Foot Border/Confirm Tiss Palp/Correlate (+) FDI	Rigid Footwear Uppers – Inefficient 1st Ray for Propulsion Lever – Friction & Torsion	Utilize BioPods Tech/Employ flexible footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Dorsum Subcu Tis Fascia Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Excessively Tight Lacing/Inefficient Windlass/Friction – RSI	Utilize BioPods Tech/Employ loosely laced flexible footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Per Brev Tendon Insert. Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Tight Lacing, Rigid Uppers, Lack of "Right Stimulus" – Friction & RSI	Utilize BioPods Tech/Employ loosely laced flexible footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Cuboid Pain Via Joint Fixation	Site Pain/Joint ROM Challenge Confirm/ Correlate (+) FDI	Tight Lacing, Rigid Uppers, Inefficient Peroneii (Fibularis) by lack of "Right Stimulus"	Utilize BioPods Tech/Employ loosely laced flexible footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Dorsi-Flexor Tendons at Tib-Talus Jt	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Tight Rigid Uppers Resist DF's Participation in Windlass/ High Heel Strains DF Tendons	Utilize BioPods Tech/Employ flexible footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Medial Ankle Lig Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Chronic Position of Calc Ever/ Pronation Strain/Rigid Uppers/ Inefficient Windlass	Utilize BioPods Tech/Employ flexible footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional

Diagnosis of Current Sx, or Rx-Program – Emerging Sx	Diagnosis Made via (FDI = Foot Dysfunction Indicator)	Tissue Specific Pathomechanics, via Gait and/or Footwear (RSI = Repetitive Strain Injury)	Treatment/Therapy
Lateral Ankle Lig Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Recur Inversion Sprains/ Unstable due to Inefficient Windlass/ Unstable 1st Ray as a Lever	Utilize BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Med Talo-Nav Lig Fibrosi	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Unstable Arch Apex/ Inefficient Windlass/RSI Med Ligament	Utilize BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
TP & FHL Tendons at Medial Ankle	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Rigid Upper Material/Talus Pronation/ Friction on & Strain of FHL & TP Tendons	Utilize BioPods Tech/Employ flexible footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Peroneii Myo-Tend Region Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Strain, Overuse, RSI of Peroneii (Fibularis) Muscles Against Unstable-Pronated Midfoot/ Due to Inefficient Windlass	Utilize BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Tendonosis of EHL, TA & EDL in Subtalar Region	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Rigid Uppers/Inefficient Dorsiflex of Ankle/Inefficient Windlass	Utilize BioPods Tech/Employ flexible footwear/Mandatory Therapy to Eliminate Fibrous Tissue/Palliative Optional
Pain of Tib-Talar Joint Fixation	Site Pain/Joint ROM Challenge/ Correlate (+) FDI	Unstable 1st Ray due to Inefficient Windlass/Stressful Propulsion/ Repeated Joint Compression	BioPods Tech/Chiropractic Manip/ Palliative Optional
Fibular Head Fixat and Fibrosis	Site Pain/Joint ROM Challenge/ Correlate (+) FDI	Inefficient Windlass/Ankle Pronat/ Med Knee Torsion/Tib-Fib Jt Stress	BioPods Tech/Chiropractic Manip/ Palliative Optional + Eliminate Fibrous Tiss
Achil. Tendonosis Retrocalc Bursitis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Rigid Heel Material/ Unstable Heel Strike/Inefficient Windlass	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Gastoc-Soleus Myotendon Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/ Everted Calc During Stance Phase/ Torsional Contraction for Propulsion	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/ Palliative Optional

Diagnosis of Current Sx, or Rx-Program – Emerging Sx	Diagnosis Made via (FDI = Foot Dysfunction Indicator)	Tissue Specific Pathomechanics, via Gait and/or Footwear (RSI = Repetitive Strain Injury)	Treatment/Therapy
Hamstring Tendon Fibrosis (M or L)	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Knee Torsion & Hyperextension at Heel Strike	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Vastus Lateralis Fibrosis Distally	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Med Torsion Knee/ Strain of all Peripatellar Fascia	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Fibrosis of Quad-Patella Fascia at Sup Pole of Patella	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Med Torsion Knee/ Strain of all Peripatellar Fascia	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Fibrosis of MCL & Med Knee Fascia	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Med Torsion Knee/ Strain of all Peripatellar Fascia	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Infrapatellar Tendon Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/Med Torsion Through Patellar Tendon/RSI	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
FHL Belly & Myo-Tendon Fibrosis	M or L Calc Pain/ Confirm Tissue Palp/ Correlate (+) FDI	Decreased Arch Apex/Elongated Tie-Beam/Strain of Myo-Tend Region/RSI	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
TP Belly & Myo-Tendon Fibrosis	M or L Calc Pain/ Confirm Tissue Palp/ Correlate (+) FDI	Decreased Arch Apex/Elongated Tie-Beam/Strain of Myo-Tend Region/RSI	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Adductor Tubercle Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Femur Internal Rotation/ RSI of Adductor Insertion	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Iliopsoas Insertion Fibrosis or Contracture	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/ Pronation/Femur Internal Rotation/ RSI of Iliopsoas Insertion in Gait	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional and/or Deep Massage of Iliopsoas/Check SI's

Diagnosis of Current Sx, or Rx-Program – Emerging Sx	Diagnosis Made via (FDI = Foot Dysfunction Indicator)	Tissue Specific Pathomechanics, via Gait and/or Footwear (RSI = Repetitive Strain Injury)	Treatment/Therapy
Greater Trochant Bursitis/Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Femur Internal Rotation/RSI of ITB-Bursa Tissues in Gait	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Glut-ITB Interface Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Femur Internal Rotation/ RSI of Gluteal-ITB Interface Fascia	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/Palliative Optional
Recurrent SI Jt Fixation (LBP #1)	Site Pain/Joint ROM Challenge/ Correlate (+) FDI	Inefficient Windlass/Pronation/ Femur Internal Rotation/ Drops Level of Iliac Crest/Compress SI	BioPods Tech/Chiropractic Manip/ Palliative Optional
Fibrosis of SI Jt Ligaments (LBP #2)	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Femur Internal Rotation/ Drops Level of Iliac Crest/RSI Ligs	BioPods Tech/ Mandatory Therapy to Eliminate Fibrous Tiss/ Check SI Jt ROM/Palliative Optional
Ilio-Lumbar Lig Fibrosis (LBP #3)	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Femur Internal Rotation/ Pelvis Torsion/RSI Ilio-Lumbar Lig	BioPods Tech/ Mandatory Therapy to Eliminate Fibrous Tiss/ Check L5 Vert ROM/Palliative Optional
Fibrosis of Iliac Crest Fascia-Erector or QL Muscles Insertion (LBP #4)	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/Femur Internal Rotation/Pelvis Drop & Torsion/ RSI of Erectors and QL Muscles	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/ Check SI Jt ROM/Palliative Optional
Fibrosis of Gluteus Muscles at Iliac Crest (LBP #5)	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/Femur Internal Rotation/Pelvis Drop & Torsion/ RSI Gluts at the Iliac Crest	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/ Check SI Jt ROM/Palliative Optional
Deep Gluteal Fibrosis and/or Contractures (LBP #6)	Site Pain/Leg "Tingle"/ Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/Femur Internal Rotation/ Pelvis Drop & Torsion/RSI Gluts	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/ Check SI Jt ROM/Palliative Optional
Low Gluteal & Hamstring/ Ischial Tuberosity Fibrosis	Site Pain/Confirm Tissue Palp/Correlate (+) FDI	Inefficient Windlass/Pronation/ Femur Internal Rotation/Pelvis Drop & Torsion/RSI Hamstring Origin/ Ischial Tuberosity Fascia	BioPods Tech/Mandatory Therapy to Eliminate Fibrous Tiss/ Check SI Jt ROM/Palliative Optional

Foot Dysfunction Indicator (F.D.I.)	Pathomechanics of the F.D.I.'s
Bunion	Non-rigid lever propulsion, with inefficient Windlass, and a consistently restricted toe box creates a valgus/compressive force onto the distal joint of the hallux; over sufficient time, bone, joint, and connective tissues remodel themselves according to the prevailing forces applied
Bunionette	Rigid upper material, compressing the 5th metatarsal, during toe off that has a torsional component; due to inefficient Windlass and 1st ray non-rigidity for propulsion; varus stress over sufficient time will induce bone and soft tissue remodeling with a varus angle, upon the distal joint of the 5th ray
Callus & Corn	Tight rigid footwear, combined with inefficient Windlass and non-rigid 1st ray lever, results in non linear propulsion; torsional stress will induce multiple opportunities for friction – the cause of callus and corn
Hammer Toe	When the absence of "Right Stimulus" fails to activate proper firing of many muscles of the foot and/or when footwear restricts toe movement (dorsiflexion), the toe flexor muscles can overpower their extensor counterparts, thereby causing "hammer toe"
Claw Toe	Absence of "Right Stimulus" fails to activate proper firing of many muscles of the foot; inappropriate flexor muscle activity with no extensor muscle activity to balance the forces, causes the "claw toe"
"Flat Feet"	Habitual, inefficient, Windlass Effect cannot create any functional arch (let alone an Optimal Arch Apex) and eventually stays flat (i.e., habitually pronated)
Pes Cavus	Tight rigid footwear, from a very young age, creates an environment in which the tibialis anterior and the peroneus longus are in simultaneous contracture, a permanent state of a high, rigid Windlass Effect results
Genu Valgus	A chronic state of pronation, due to inefficient Windlass Effect, will readily lead to internal rotation of the tibia and femur with contracture of the iliopsoas, and will put the ipsilateral knee into a valgus position

This table is intended to demonstrate the relationship between Foot Dysfunction Indicators and the maladapted foot mechanics that created each indicator.

Each example here, begins with the assumption of an absence of "Right Stimulus" and demonstrates a possible, chronic manifestation of "Wrong Movement"

Foot Dysfunction Indicator (F.D.I.)	Pathomechanics of the F.D.I.'s
Genu Varus	A chronic state of pes cavus, due to simultaneous contractures of tibialis anterior and peroneus longus, but with tibialis anterior in a dominant, overpowering state; the ipsilateral knee will be put into a varus position
Pigeon-Toed	If both feet have similar degrees of pronation, due to inefficient Windlass Effect, and bilateral internal tibial rotation occurs, then to internally rotate the femurs, the iliopsoas muscles will become contractured; thus each leg notably rotates internally – "pigeon-toed"
Hallux Valgus	Non-rigid lever propulsion, with inefficient Windlass Effect, creates torsion at toe-off that, via much repetition, develops into a valgus deformation of bones and joint of the hallux
External Hip Rotation	A chronic state of inefficient Windlass Effect, creating pronation, internal rotation of tibia and femur, strains the iliopsoas to a position of weakness and the antagonist gluteal muscles develop and display dominance, which becomes an externally rotated hip joint, affecting the entire leg
Forefoot Splay	A non-rigid lever for propulsion, with an inefficient Windlass Effect, in a moderately loose toe box, can have the effect that multiple, deep muscles attempt to stabilize the foot, for propulsion, by abducting the toes (i.e., 'splaying' them)
Longitudinal Toe Rotation	Absence of "Right Stimulus" allows random and inappropriate muscle activity; a metatarsal influenced by a chronic state of (moderate) dorsiflexion with either contractured adduction or abduction, will (in time) result in the longitudinal rotation of that metatarsal
Overlapping Toes	Absence of "Right Stimulus" allows random and inappropriate muscle activity; a chronic state of either adduction with dorsiflexion, or abduction with dorsiflexion, adjacent to a metatarsal affected by mildly contractured flexion, will (in time) result in one toe crossing another

This table is intended to demonstrate the relationship between Foot Dysfunction Indicators and the maladapted foot mechanics that created each indicator.

Each example here, begins with the assumption of an absence of "Right Stimulus" and demonstrates a possible, chronic manifestation of "Wrong Movement"

Foot Dysfunction Indicator (F.D.I.)	Pathomechanics of the F.D.I.'s
Loss of Toe Gaps	The use of tight fitting shoes, especially with a narrow toe box, in the presence of an inefficient Windlass Effect and absence of "Right Stimulus" (thus poorly stimulated deep muscles of the foot), contractures of the adductor muscles can occur, thus approximating all of the metatarsals
Misaligned SubtalarJoint Region	Inefficient Windlass Effect cannot create the optimal arch apex, and: (a) with lack of "Right Stimulus," and a common lack of tibialis anterior activity, the midfoot pronates, shifting the subtalar joint region medially; or (b) with lack of "Right Stimulus," and a rare, but possible, increased tibialis anterior activity, will shift the subtalar joint region laterally
Pronated Forefoot & Inverted Calcaneus	With lack of "Right Stimulus," a rare combination of inappropriate muscle activities can occur... such as: less of tibialis anterior/more of peroneus longus = pronated fore-foot, and contractured medial longitudinal region of the gastroc-soleus = inverted calcaneus
Supinated Forefoot & Everted	With lack of "Right Stimulus," a rare combination of inappropriate muscle-calcaneus activities can occur, such as: less of peroneus longus/ more of tibialis anterior = supinated fore-foot, and contractured lateral longitudinal region of the gastroc-soleus = everted calcaneus
Everted Calcaneus	With lack of "Right Stimulus," a contracture of the lateral longitudinal region of the gastroc-soleus muscle is possible to develop, which will evert the calcaneus
Inverted Calcaneus	With lack of "Right Stimulus," a contracture of the medial longitudinal region of the gastroc-soleus muscle complex is possible to develop, which will invert the calcaneus
Bony Protuberances of the Foot	Inefficient Windlass Effect allows a poorly aligned lever system and very poor arch formation, that can result in bones 'jammed' into each other in such a way as to stimulate abnormal bone growth to mitigate the forces; visible bumps can occur externally; this can occur at a variety of sites
High Iliac Crest	Inefficient Windlass Effect leads to pronation and inefficient arch stimulation, that 'shortens' that leg, which lowers the ipsilateral iliac crest; the contralateral ilia then appears higher

This table is intended to demonstrate the relationship between Foot Dysfunction Indicators and the maladapted foot mechanics that created each indicator.

Each example here, begins with the assumption of an absence of "Right Stimulus" and demonstrates a possible, chronic manifestation of "Wrong Movement"

Foot Dysfunction Indicator (F.D.I.)	Pathomechanics of the F.D.I.'s
Pelvic Torsion	Inefficient Windlass Effect, can induce internal rotation of both the tibia and femur, which when asymmetric, will create an anterior shift of the ipsilateral ilia, appearing as pelvic torsion
"Pump Bumps"	Rigid and hard edged heel counters, especially combined with high heels, with a poor ability to dorsiflex, will react to the constant friction in the form of thickened/hypertrophied tissue at the Achilles'/calcaneal region
Fifth Toe "Flail"	Absence of "Right Stimulus," and resultant ineffective Windlass Effect, which creates forefoot pronation, can allow such inappropriate muscle activities as excess extension of the 5th metatarsal, as an inefficient attempt to induce a partial Windlass at the least resistant region
Excessive Ankle Plantar Flexion (when non-weight-bearing)	Absence of "Right Stimulus," while wearing shoes with tight, rigid uppers (especially if high heels are frequently worn), the ability of the tibialis anterior, peroneus longus and extensor hallucis longus to collectively dorsiflex the ankle becomes greatly diminished, to the point at which, in a non-weight-bearing situation, the plantar flexors hold the ankle in a position of plantar flexion

This table is intended to demonstrate the relationship between Foot Dysfunction Indicators and the maladapted foot mechanics that created each indicator.

Each example here, begins with the assumption of an absence of "Right Stimulus" and demonstrates a possible, chronic manifestation of "Wrong Movement"

24 KEY TAKEAWAY

"The foot is a masterpiece of engineering."
(Leonardo da Vinci)

To rectify the effects of traditional footwear (ie; all the pain, deformity, degeneration, and suffering), simply unfetter the foot and stimulate it. This emulates the 'barefoot experience' and restores the foot to its rightful capacity as a "masterpiece of engineering."

Addendum: Contraindications and Challenging Applications that may require additional considerations

There are several contraindications and pathology symptoms that may require additional considerations.

a) Contraindications

One absolute contraindication for implementation of BioPods Stimsoles is hallux rigidus, or complete immobility of the hallux due to genetics, arthritic, traumatic, or surgical fusion.

The healthcare practitioner should verify complete immobility by attempting to move the great toe by passively challenging the hallux into its extended position. If the great toe is fused (i.e..completely rigid), BioPod Stimsoles will have little or no benefit and may be uncomfortable for the user. (Figure 4.6.)

If the healthcare practitioner can demonstrate at least moderate, passive extension in the great toe, BioPods Stimsoles may be employed. (Figure 4.7.)

Figure 4.6.

Figure 4.7.

b) Challenging Applications

While most patients will adapt to BioPods Stimsoles with minimal issues, there are a number of potentially difficult applications that, despite initial indications of less-than ideal applicability, can be overcome with the use of complementary therapies. These situations may also indicate an exception to the criteria for selecting the appropriate BioPods stimulus level.

i. Absence of voluntary neurologic control of extensor hallucis longus muscle activity offers an unpredictable outcome. (Figure 4.9., page 14) Success will likely depend on the specific cause of the loss of voluntary extensor hallucis longus activation (e.g., peripheral neuropathy, MS, ALS, Parkinson's). In some instances, BioPods may induce reflex activation of the extensor hallucis longus; therefore, it is a clinical trial worth pursuing. In these instances, the practitioner may want the patient to test various BioPods stimulus levels to determine which will produce optimal results, depending on the patient's condition and footwear type.

25 KEY TAKEAWAY

The vast majority of dysfunctional feet (excluding those with hallux rigidus) can be rehabilitated with BioPods usage.

ii. Inability to dorsiflex one of both of the talonavicular joints beyond the 90° position due to mechanical joint fixation indicates that mobilization or manipulation would be of benefit. (Figure 4.8.) The practitioner should select the therapy they believe will be most applicable and recommend self-therapy (e.g., heel walks and/or repetitive, active, full-range dorsiflexion with the heel resting on the floor) concurrent with regular BioPods usage during gait.

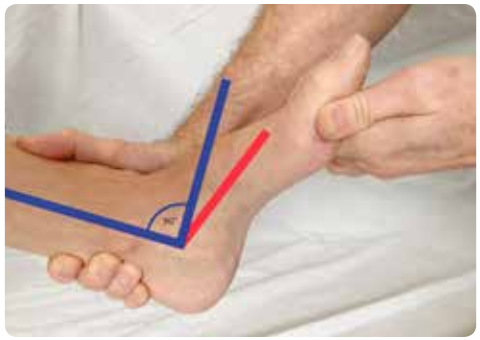


Figure 4.8.

iii. Neurologic loss of voluntary control of either or both tibialis anterior or peronei (fibularis) muscles offers an unpredictable outcome. (Figure 4.9.) Success will likely depend on the specific cause of the loss of voluntary tibialis anterior and/or peronei muscle activation (e.g., peripheral neuropathy, MS, ALS, Parkinson's). In some instances, BioPods may induce reflex activation of the tibialis anterior or peroneii; therefore, it is a clinical trial worth pursuing. In these instances, the practitioner may want the patient to test various BioPods stimulus levels to determine which will produce optimal results, depending on the patient's condition and footwear type.

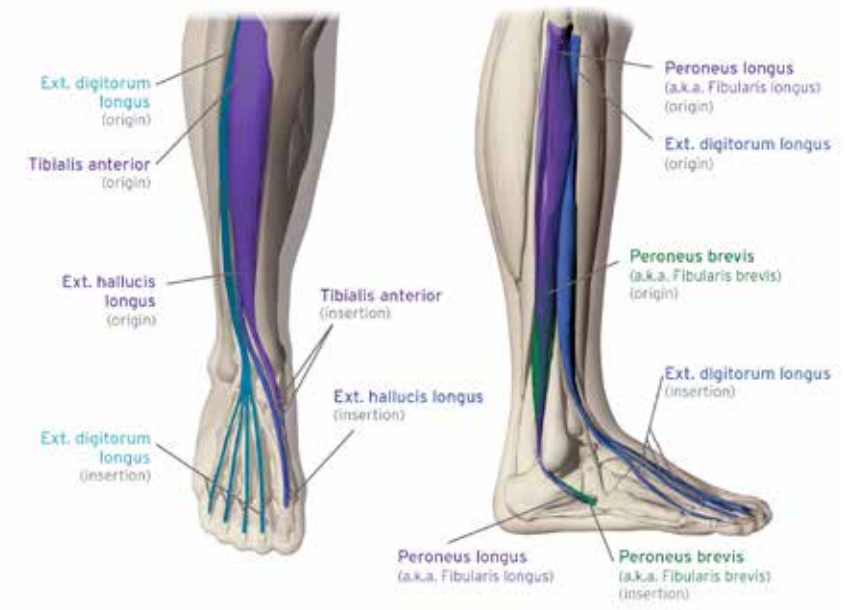


Figure 4.9.

iv. Ballerina ankle configuration is a condition in which there is a virtual straight line down the tibia and foot dorsum when lying supine. (Figure 4.10.) This may indicate that the muscles of ankle dorsiflexors are much weaker than their antagonist plantar flexors and may also demonstrate insufficient dorsiflexion at the talonavicular joint due to a mechanical fixation. In this case, the practitioner should employ one of the following strategies, depending on the severity of muscle imbalance:

1. Mobilization or manipulation therapies concurrent with BioPods use – to restore sufficient mobility to the talonavicular joint. In addition, recommend self-therapy that includes heel walks and/or repetitive, active, full-range dorsiflexion with the heel resting on the floor.

2. When a significant muscle imbalance is observed, the aforementioned therapies may be needed as a "pre-therapy" before a justifiable positive outcome can be expected and BioPods can be put to use.

Figure 4.10.
Ballerina ankle configuration.

v. Notably fibrotic regions, especially at the myotendonous junction and/or insertions of the tibialis anterior and/or peroneii may become painful as a result of the stimulus intensity of BioPods Stimsoles. (Figure 4.11.) After evaluating the severity, thickness, and chronicity of the fibrotic regions, you may opt to employ one or more soft tissue mobilization therapies (e.g., therapeutic ultrasound, A.R.T., Graston Technique®, deep tissue massage) to reduce or eliminate the fibrotic tissues prior to or during implementation of BioPods Stimsoles. In these cases, the patient may initially require a lower BioPods stimulus level until the fibrotic tissue has been sufficiently reduced or eliminated.

Figure 4.11.

26 KEY TAKEAWAY

There are several types of foot dysfunction that require pre-therapies or concurrent therapies (with respect to BioPods usage) for optimal foot and kinetic chain rehabilitation.