



How to Answer Bracing

By Don **Buethorn**, CPO

Assessment and fitting of pediatric orthoses

The scenes in the movie *Forrest Gump* that show a child growing up in the 1950s, his legs caged in by clunky metal, are a common reference point for parents new to bracing. This is a treatment they would not care to take on. It's natural for parents to question the need—"Will my child benefit from using braces?"

Over years of working with children, parents, and PTs, I have refined my answers to encourage a pragmatic grasp of what challenges bracing can help. Here are some thoughts that might help you give the parents of your patients a more realistic perspective.

THE QUESTIONS

Though parents may trust your opinion implicitly, they want a way to think about the issue that they can see evidence of and discuss rationally. The question expands into a series of questions: Should I be concerned? Should my child wear a brace at all?

In answering this question, the type and magnitude of the motor skill delay the PT has assessed is useful.

There can be social stigma connected with wearing a brace. Parents may fear taunts by other children, rude stares, and so on. If this is an issue with a particular family, keep it in mind as you select a brace style. A less obtrusive brace style is more likely to be worn than a high-profile one that may



the Question

attract unwelcome notice, and it may be an acceptable choice as long as it does at least some good. For example, if a child is often in an environment with other children who wear braces, brace wear may not seem like a big issue. This is especially true for very young children.

And bracing clearly has a positive effect. In a study of children with hypotonia and flatfoot dysfunction, findings concluded that Cascade orthoses and an exercise program resulted in significant improvements and positive trends, including velocity, step length, single-limb support, and cadence changes.¹ The specific effects of supramalleolar orthoses (SMOs)—

orthoses that cover the ankle—also have been researched. In one study of children with Down syndrome, findings revealed significant improvements in walking, running, and jumping, both at the time of fitting and after 7 weeks of wearing SMOs.² And orthotics pioneer Nancy Hylton has stated that flexible orthoses provide improved and more consistent proprioceptive feedback, which in turn improves control of movement.³

WHICH BRACE IS RIGHT?

Parents do not need to know the biomechanical techniques used to derive an effect; they just need to know

the problem that is being solved. Presenting choices to parents in a way that describes the gait dysfunctions they address gives the parents less of a cognitive burden in considering options.

Will the patient be dependent on braces for the long term?

Since the atypical movement patterns we see can result from a wide range of conditions (and combinations of conditions), it is not realistic to make a categorical prediction at the treatment's outset. However, if, given the diagnosis, it is possible for a child to develop better voluntary control, then our orthoses will help develop his or her potential for improved movement.

Our goal is not just to support a child's foot, but to guide it toward correction. We do see improvement on a regular basis. The key to systematic lowering of support is to have options available for a smooth transition to the next level down.

GENERAL PHYSICAL THERAPY CONCERNS

The function of a child's foot and gait must be considered in the context of not simply bracing, but in a larger holistic integration of the entire sensory-motor skills system. The bracing solution must support the PT's goals to accelerate motor development, as well as the orthotist's concerns about the role of a more functional foot position, appropriate device, and level of stability. (It is highly beneficial for a patient to receive the combined efforts of a team of professionals: a physician, a PT, and an orthotist, for instance.) For example, PTs are often motivated to seek a bracing solution because they are concerned that the patient's poor foot position will make it hard to develop foot-knee-hip-trunk control.

Other global considerations—type of dysfunction, family and home life (including the level of home support expected), school situation, and attitudes of the individual patient, for example—can carry a great deal of weight.

NORMAL AND ABNORMAL FOOT-POSITION DEVELOPMENT

To help parents understand what needs to be corrected in their child's



gait, it's useful to have a practical explanation of how gait normally develops. Children may not have a "typical" gait until 6 or 7 years of age. Sit-to-stand, in particular, can happen in unusual ways. The typical baby's foot presents a pronated appearance, with an abundance of soft tissue and flat feet. Children don't start out with good foot position, but they normally find it fast if their sensory-motor skills are functioning properly. For every child, an important part of foot-position development is experimentation.

However, if a PT asks us to support the foot position of a very young child, it is usually because of a bigger motor developmental delay: gait challenges are anticipated as part of a larger,

slightly forward (in about 3° of dorsiflexion). This neutral position, in my view, is the best position for both weight-bearing and the "swing phase" of the gait. If it is possible to achieve this position without pain or discomfort to the patient, we aim to cast or measure the foot in this best position of function.

2) Learn movement by moving.

In order to learn good movement, the foot needs to be able to move repeatedly. A child who lacks the skills to recruit voluntary control, if left untreated, never experiences the repeated success that normal movement provides. A brace that allows some movement while serving as a "training aid" toward typical gait is the clear path to

overarching goal is to provide the least amount of support that will achieve the best position of function.

PATIENT PRESENTATIONS AND SOLUTIONS

Patients come to us with a wide range of skills, needs, and developmental levels. Since early bracing can reinforce good foot position and prevent bad habits from becoming ingrained, we have created a subset of patient groups and solutions for the pediatric population. The presentation types relevant to early pediatric groups (birth to 3 years old) include:

- Pronation and supination—pronation due to weakness or lack of integrated muscle control of the feet; or pronation-supination due to high muscle tone in lower extremities.
- Inconsistent ankle—unsteady, erratic, or unstable foot position and movement.
- Toe walking—absent or delayed heel contact during gait; often due to high muscle tone or sensory issues; may be idiopathic.
- Knee hyperextension—caused by weakness or high tone.

After determining what presentation group a child fits into, we examine the set of braces available as choices for each presentation. As a child's skills improve toward age-appropriate abilities, it also is important to have available a corresponding bracing path of diminishing support.

SOLUTIONS FOR THE PEDIATRIC POPULATION

Cascade offers two types of orthotic solutions. Custom dynamic ankle-foot orthoses (DAFOs) are created from a cast of the patient's foot. They provide levels of support from moderate to very strong. If a child's foot is not fully correctible to a typical position or needs significant support for correction, a custom DAFO is a good choice.

Fast Fit products, the new type of orthotic solution for feet that are fully correctible to a typical position, do not require casting. JumpStart products, part of Cascade's Fast Fit family, use a premanufactured precision-molded double shell (one nested inside the other) for both wrap around control



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known condition. An example is the case of, say, a 2-year-old who is pronated and has extreme extensor tone, preventing even a standing position. This represents a delay of at least a full year. In this case, foot position is deemed crucial, since he cannot begin standing (or progress developmentally in his gait) until his foot and ankle are corrected. Pronation in a typically developing 2-year-old is not as critical.

CASCADE APPROACH

My basic approach to bracing has three parts.

1) Best position of function.

By this I mean a relatively balanced, neutral, typical stance, neither pronated nor supinated. We attempt to bring the foot into this position: heel vertical, forefoot horizontal, ankle angled

eventually diminishing orthotic support. Choosing a brace that will allow movement where the child's gait is functional—starting with what they do right—is a highly effective alternative to more restrictive bracing.

3) Least amount of support.

Rather than brace heavily, we want the foot to experience as much useful movement as possible. We want the child to explore foot position in a guided range: think of guardrails on a highway, with the freedom to move ahead but with protection from danger. For this to happen, we make braces with as much flexibility as possible along the axes where the child has good foot control, providing support (for pronation/supination, DF/PF, eversion/inversion) where the child needs it. Our

and extra heel stabilization.

Whether the choice is to cast for a custom DAFO or to simply measure



To learn more about Cascade's Fast Fit products, including the JumpStart line, read the online version of this article.
www.PTPProductsOnline.com

for a Fast Fit product, it is key to work within the overall therapy goals and to build on the functional aspects of your patient's movement skills. [References are available in the online version of this article.] **PTP**

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ORTHOSES TECHNOLOGY

With the aim to provide clients with the most optimal orthosis fit, PTs may consider recommending over-the-counter orthoses or custom orthoses. There's no doubt that customer prescription foot orthoses have a much greater potential to effectively and permanently treat painful conditions—from the toes to the lower back—since they are designed specifically for an individual's biomechanical nature. Custom orthoses can be created via casting and fabricating or computerized foot orthosis technology.

Computerized foot orthosis technology continues to evolve. Measurements are usually obtained with a walking mat, on which clients stand, and a connected computer system that scans the client's feet as the clients walk on the mat. Computerized scanning allows professionals to analyze a multitude of aspects, including the distribution of plantar pressures throughout each

individual foot. The ultimate goal is to normalize the biomechanical patterns of the feet with custom orthoses. Electronically stored measurement data allows for repeat fabrication of a client's orthoses in the case of additional orthosis requests by the client. Digital records of measurement data also allow for easy analysis of changes in the client's feet and/or gait patterns, especially useful for patients with progressive conditions such as diabetes or arthritis.

Ultimately, determining the appropriate orthosis for a client involves considering a range of factors including diagnosis, range of motion, strength, tone, gait pattern, and pain. Whether orthoses are made by traditional casting and fabricating methods or computerized scanning technology, the goal of foot orthoses is to decrease pain, and improve function, stability, and mobility. **PTP**

— Arati Murti

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