

# FACT SHEET



SECTION ON  
**PEDIATRICS**

AMERICAN PHYSICAL THERAPY ASSOCIATION

## Using Evidence to Select an Ankle Foot Orthosis (AFO) for Children With Cerebral Palsy

### What Types of AFOs Are Appropriate to Consider for Children With Cerebral Palsy?<sup>1</sup>

*Standard (Solid Ankle) (SAFO):*  
No motion at ankle  
(pictured right)



*Hinged (Articulated) AFO (HAFO):*  
Free dorsiflexion, 0° plantarflexion (pictured left)

*Posterior Leaf Spring (PLS):*  
Limited, resisted, plantar flexion and dorsiflexion, with only a few degrees of motion, posterior trim line behind malleolus, giving it a thin posterior heel support that widens into a calf band (pictured right)



*Ground (Floor) Reaction AFO:* Rear-entry device with anterior shin and foot sections (pictured left)



#### **Not pictured:**

*Dynamic AFO (DAFO):* Free dorsiflexion and plantarflexion and wraparound foot and ankle

*Tone Reducing AFO (TRAFO):* Ankle dorsiflexion limited by hinge block with raised toe plate, molded arch, and transverse metatarsal arch

*Dual Carbon Fiber Spring (CFO):* Carbon fiber at dorsal part of orthosis, 0° plantarflexion

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## How Do I Incorporate Research Evidence Into My Clinical Decision Making?

This information needs to be combined with clinical expertise and individual/client values to achieve evidence-based practice. Application of this process includes the use of the evidence to make decisions on interventions to meet the identified individual/client outcome. Peer-reviewed journal results reflect group means with individual variation. Therefore, individual/client data (systematically collected) must be monitored to see if the outcome is being achieved or if the intervention needs to be changed.

## What Are Some of the Conclusions Regarding Utilization of AFOs?

- AFOs may provide better functional outcomes than standing or walking barefoot for children with CP, but the type of AFO does not always make a significant difference in the outcome<sup>2,3</sup>
- Research supports the concept that the benefit of orthotics is limited to the direct mechanical effect on the joint it covers<sup>4</sup>
- Functional benefit of AFOs is likely due to the external support and stability provided by the brace and to limiting the available range of motion<sup>5</sup>
- AFOs that limit plantarflexion have a positive effect on equinus gait but their effects on other functions are not known<sup>6,7</sup>
- DAFO, SAFO, PLS, HAFO, and Ground Reaction AFOs all failed to improve static foot alignment in the majority of children with CP who could walk<sup>5</sup>
- Young children who are independent walkers benefit greater from AFOs than children using assistive devices<sup>8</sup>
- Tone-reducing design did not seem to improve any functional outcome measurements<sup>6,7</sup>
- Wearing orthotics, compared to no orthotics, did not improve ambulation and balance when measured in a simulated functional context for

children and adolescents with cerebral palsy<sup>9</sup>

- If the use of an orthosis improves walking, it does not necessarily improve stair climbing, running, or jumping<sup>6</sup>

## How to Begin?

- Begin with a specific diagnosis: CP, spastic quad, spastic diplegia, hemiplegia, Down syndrome, spina bifida
- Identify an age range
- Describe the child's level of function before and after intervention
- Have a clear description of the type of AFO being considered
- Look for recent systematic review articles and randomized control trial articles
- Consider what level of significance is needed. Statistically significant is a result of numeric calculation. If observation of individuals suggests a difference, then the results are clinically different. Walking during day-to-day activity makes the data ecologically relevant
- Do not generalize results beyond the specifics of the article

## How Do I Know Which Type of AFO to Recommend?

Given the limitations of AFOs identified in peer-reviewed research:

### *Consider a Standard (Solid) AFO When:*

- External support, stability, and limit on ankle range of motion are needed<sup>5</sup>
- Ankle motions are excessive and a more stable ankle is needed<sup>5</sup>
- Increased stride length and decreased cadence are desired<sup>3</sup>

- Specific skill execution is limited when barefoot<sup>10</sup>
- Walking results in excessive energy expenditure<sup>11</sup>

**Consider a Hinged (Articulated) AFO When:**

- Dorsiflexion at initial contact is limited or absent<sup>12</sup>
- Shoes provide limited plantarflexion power<sup>12</sup>
- A dynamic equinus deformity is present in children with hemiplegia<sup>13</sup>
- Sit-to-stand takes too long<sup>14</sup>
- Walking speed and stride length are too short in children with hemiplegia<sup>13,15</sup>
- A heel-toe pattern is lacking<sup>15</sup>
- There is excessive knee hyperextension in children with hemiplegia<sup>2</sup>
- More dorsiflexion is needed on stairs<sup>16</sup>

**Consider a Dynamic AFO When:**

- Increased stride length, decreased cadence, and decreased ankle motion are desired<sup>3</sup>
- Motor skills (crawling/kneeling, standing, and walking/jumping) as measured on the Gross Motor Function Measure (GMFM) are delayed or absent<sup>8</sup>

**Consider a Posterior Leaf Spring Brace When:**

- Knee extension needs to be increased<sup>2</sup>

**Consider Dual Carbon Fiber Spring (CFO) When:**

- Power during push-off is limited<sup>17</sup>



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### ADDITIONAL RESOURCES:

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### For More Information:

If you have additional questions, would like to order additional copies of this fact sheet, or would like to join the Section on Pediatrics, please contact the Executive Office of the Section on Pediatrics of the American Physical Therapy Association at: APTA Section on Pediatrics, 1111 North Fairfax Street, Alexandria, VA 22314, [peditrics@apta.org](mailto:peditrics@apta.org), [www.pediatricapta.org](http://www.pediatricapta.org).

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