

Barefoot vs. Orthosis: Is there an order effect on gait analysis?

A.H. Black, B.J. Sawatzky, R.D. Beauchamp, V. Ward and K. Mulpuri

Shriners Gait Lab

Children's & Women's Health Centre of British Columbia, Vancouver, BC, Canada

Introduction:

Most reports^{1,2,3} suggest that clinically prescribed orthoses result in changes in velocity, cadence and step lengths in children with cerebral palsy. However, it is not reported in any of the studies whether an order effect has been ruled out. The order of the data collection could play a significant role in the temporal spatial changes seen in children with and without orthoses. Most gait labs collect barefoot motion data followed by the orthoses trials. To date no studies have investigated whether or not this protocol introduces a bias in the data as the child becomes "comfortable" in the motion lab.

Statement of Clinical Significance:

The aim of the study was to determine whether there is any order effect in gait analysis between walking with orthoses, such as an AFO, and barefoot walking.

Methods:

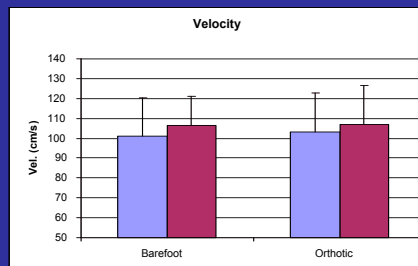
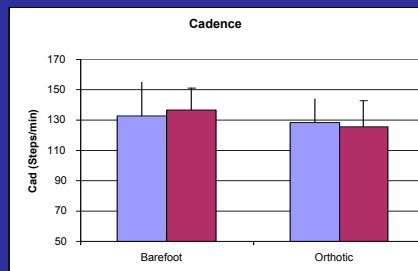
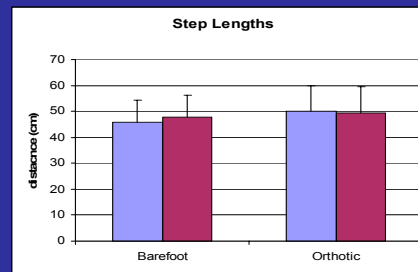
This is a prospective study involving patients attending gait analysis. All subjects in this study had some form of cerebral palsy (spastic diplegia, or hemiplegia). One group of patients (n=32 legs) had gait analysis with orthoses (OT) first followed by barefoot (BF) and the other group (n=44 legs) had barefoot trials followed by orthoses trials.

Kinematic data were collected using a 6 camera Motion Analysis Corporation (Santa Rosa, CA) system using Eva 6.0.2 software. The step length, velocity and cadence were calculated using OrthoTrak 5.0.2 (MAC) software. The data analysis was done using a repeated measures ANOVA. Significance was set at $p < 0.05$

Results:

There were 38 children in the study (19 males, 19 females). Mean age was 8.9 yrs. The data show that there was no order effect between the walking with orthoses first or with barefoot first for velocity, stride length or cadence.

Irrespective of order walking with orthoses improved step length ($p < .005$), decreased cadence ($p < .005$) but did not alter velocity ($p > 0.05$).



Legend:
Blue square: Barefoot First
Red square: Orthotic First

Discussion:

The impetus for this study was drawn from clinical questions regarding the effect of patient comfort in the gait lab setting. The present comparisons between braced and barefoot gait analyses both support^{1,2} and refute¹ previously published data. This study indicates that step length increases, cadence decreases and velocity remains unchanged when an orthoses is used regardless of trial order.

During a pilot study for the current investigation we found that there was indeed an order effect, that is the temporal spatial data collected were different depending on whether brace was tested first or last (see abstract).

However, when we increased the sample size and used only children with CP there was no order effect. This is clinically significant as it means that regardless of which data are collected first (brace or barefoot) there is no difference in the effect of the brace on the child.

Interestingly, in other groups such as spina bifida, traumatic brain injury and clubfoot, we have seen order effect differences between brace first and barefoot first conditions, however these samples, to date, are too small to make definitive conclusions.

Conclusion:

In patients with cerebral palsy (diplegia or hemiplegia), there is no concern with whether the brace or barefoot is tested first.

References:

- White H, et al . Dev Med Child Neurol 2002; 44(4):227-32
- Radka SA, et al . Phys Ther 1997; 77(4):395-409.
- Dursum E, et al. Disabil Rehabil 2002; 24(7):345-7.