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The gait profile score to assess the effects of ankle-foot orthoses in the gait of children with cerebral palsy

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1. Introduction

The ankle-foot orthosis is the most common non-invasive therapeutic intervention used to correct gait deviations, especially in children with Cerebral Palsy (CP). Several studies demonstrated that its use improved spatio-temporal and kinematic outcomes. However, biomechanical reports can be complex and may need experience to correctly interpret the results. Gait deviations indices, such as the Gait Profile Score (GPS) intend to summarize some clinically meaningful parameters and clarify in which way an ankle-foot orthosis impacts gait in children with CP.

2. Research question

The aim of this study was to assess if GPS reflects the effect of the AFO-use on a sample of children with CP while walking.

3. Methods

This was a prospective study of children with spastic CP (unilateral and bilateral). All had an AFO prescription (SAFO; DAFO or HAFO). Data collection was performed with the use of 14 optoelectronic cameras at 100 Hz and 2 force plates. Data was collected in a one-day session, where children walked in a 10 m corridor, with both conditions (Barefoot and AFO-use). GPS was calculated in Visual 3D software.

4. Results

Eight children with spastic CP (three unilateral and five bilateral) with an age range: 4–10 years (height 1.17 ± 0.14 m; mass 24.25 ± 8.26 kg) and grades I and II in the Gross Motor Function Classification System participated in this study. GPS score decreased in five subjects (3.38 ± 2.3) and increased in three subjects (2.1 ± 1.1). According to the indicated MCID value (1.68°) [1], four subjects showed an improvement in the GPS score, ranging from 1.7° to 6.6°, and two subjects worsen their GPS overall results (Table-1).

Table. 1

Subject	Condition	GPS Left	GPS Right	GPS Overall	GPS Overall Diff
1	Barefoot	7.4	10.2	9.2	−1.7
	AFO	6.4	8.4	7.9	
2	Barefoot	23.6	12.2	19.3	−6.6
	AFO	11.9	12.6	12.7	
3	Barefoot	13.5	11.2	13.2	+0.9
	AFO	12.9	13.2	14.1	
4	Barefoot	8.1	9.8	9.1	+3.4
	AFO	13.9	9.6	12.5	
5	Barefoot	7.5	7.4	8.0	+1.9
	AFO	10.0	7.6	9.9	
6	Barefoot	9.4	17.2	14.7	−4
	AFO	10.5	10.2	10.7	
7	Barefoot	16.2	15.5	17.2	−4.6
	AFO	12.2	9.9	12.6	
8	Barefoot	10.6	16.1	16.0	−0.1
	AFO	12.3	17.5	15.9	

5. Discussion

Previous studies have demonstrated evidence supporting the use of GPS to describe the pathological gait in children with CP and the effects of surgery [2,3] or AFO-use [4]. The latter showed that bilateral children with spastic CP did not evidence different values regarding the overall GPS between barefoot and AFO-use condition. In our study, of the five subjects with bilateral CP, Subject-001 and 007 presented a meaningful clinical improvement ≥1.6° (1.6° and 4.6°, respectively). On the other hand, Subject-005 decreased the overall value of 1.9°. The referenced study [4] did not clarify which gait patterns may influence the therapeutic purposes and AFO effects [5]. We have identified three types of gait patterns in our sample, whereas two presented a true equinus gait, one jump gait and two subjects with apparent equinus [6], and consequently the AFO type was also different. This fact highlights the importance of the uniformization and clarification of the sample characteristics and AFO prescription to enable a better comparison between studies with less outcomes variability [7]. Regarding GPS, there should

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be caution for its use in the assessment of AFO effects in children with CP due to methodological considerations.

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