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O 095 - How do postural parameters vary during gait in children with cerebral palsy? A 3D subject-specific skeletal segment registration technique.

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Introduction

Postural parameters, calculated in static position on frontal and sagittal radiographs, are altered in ambulant children with cerebral palsy (CP) and are known to be related to gait abnormalities [1,2]. Most of these parameters are positional and could vary during gait. Their computation could be performed using gait simulation models that are usually generic or semi-personalized [2,3]. There are currently no studies investigating how subject-specific postural parameters are modified during gait in children with CP.

Research Question

How do postural parameters vary during gait in children with CP?

Methods

14 typically developing children (TD-group, age:11.7±4year) and 14 children with cerebral palsy (CP-group, age:11±4year, Hemiplegia:N=4, Diplegia:N=10) underwent gait analysis using Davis protocol [3] with additional markers on thighs and shanks. Subjects then underwent low-dose biplanar X-rays in standing position with the reflective markers still in place. Subject-specific 3D reconstruction of the spine, pelvis and lower limbs were performed with calculation of 3D radiological postural parameters in the static position: pelvic tilt(PT), sacral slope(SS), acetabular abduction(Acetabular_Abduction), anteversion(Acetabular_Anteversion) and tilt(Acetabular_Tilt) [4] as well as anterior (Ant_Acet_coverage) and posterior (Post_Acet_Coverage) acetabular coverage over the femoral head. 3D bones were registered on each frame of the gait cycle [5] (figure 1). A new technique developed for this study, utilizing finite element modeling, was used to reduce soft tissue artefacts. The same postural parameters were then computed during the gait cycle, using the 3D registered bones, at each time frame: means and ranges of motion (ROM) were calculated then compared between TD and CP.

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