Group #27

Development of a 2-Segment Foot Model

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Abstract

Given the complexity of the human foot, single segment models can fail to capture the true nature of the foot's motion, especially with the presence of deformities seen in many patients with Cerebral Palsy (CP). Two 2-segment foot models, Rady A and Rady B, were developed using the existing Rady Marker Set and a model validation test was performed by evaluating angular joint positions across controlled movement patterns including dorsiflexion-plantarflexion, inversion-eversion, and internal-external rotation using 3D Printed Foot Models isolating specific foot segments. The virtual models were graded on calculating joint angle accuracy, 10° incremental responses, and consistency in incremental responses, with Rady B demonstrating superior accuracy in responding to 10° incremental changes. Rady B was then applied to 14 normative patients along with the current Single Segment Rady Foot Model, and both were compared to published normative gait data from several developed and validated 2-segment models. Rady B's hindfoot and forefoot kinematics aligned closely with the established 2-segment models from literature in terms of overall pattern, shape, and timing, while exhibiting expected offset differences attributed to landmark and segment creation.