

# Physical Therapy Incorporating Equine Movement: Kinetic Interactions Children with Cerebral Palsy and the Horse

Priscilla Lightsey<sup>1</sup>, Yonghee Lee<sup>2</sup>, Nancy Krenek<sup>1</sup>, Pilwon Hur<sup>2,3</sup>

<sup>1</sup>Physical Therapy, ROCK (Ride On Center for Kids), USA

<sup>2</sup>Mechanical Engineering, Texas A&M University, USA

<sup>3</sup>Mechanical Engineering, Gwangju Institute of Science and Technology, Korea

**Background / Aims:** Physical therapy treatment incorporating equine movement is recognized as an effective tool to treat functional mobility and balance in children with cerebral palsy (CP). To date, only a few studies have examined kinematic outputs of the horse and a participant when mounted. In this pilot study, we examined the interaction between the horses and children with CP during physical therapy sessions utilizing equine movement to better understand the effectiveness of this type of treatment.

**Methods:** Four children with CP received eight physical therapy sessions incorporating hippotherapy as a treatment intervention. Functional mobility was assessed using the Timed Up and Go or the 10m Walk Test. Inertial measurement unit sensors, attached to children and horses, recorded movements and tracked acceleration, angular velocity, and body orientation.

**Results:** Results of the functional tests showed modest improvements over time. Sensor data, using the inertial measurement device, revealed that the children's movements (quantified in frequency and temporal domains) increasingly synchronized to the vertical movement of the horse's walk, demonstrated by reduced frequency errors and increased correlation. The findings suggest that as the sessions progressed, the participants appeared to become more familiar with the horse's movement.

**Conclusions:** Since the horse's gait at a walk mimics the human gait, this type of treatment may provide individuals with CP, who have abnormal gait patterns, an opportunity for the neuromuscular system to experience a typical gait pattern. The horse's movement at the walk is consistent, cyclical, rhythmical, reciprocal and multi-dimensional, which can facilitate motor learning. Thus, the increased synchronization between horse and the mounted participant suggests that physical therapy utilizing equine movement is a viable treatment tool to enhance functional mobility. This study may provide a useful baseline for future work.

**keyword:** Cerebral Palsy, Physical Therapy, Equine movement