

Changes in Dynamic Trunk/Head Stability and Functional Reach after Hippotherapy

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Abstract:

Hippotherapy (HPOT) is the use of the rhythmic movement of a horse to provide input to multiple systems in the body to effect therapeutic gains (Benjamin, 2000). Beliefs about the positive effects of hippotherapy are strongly held (AHA, 2000; Benjamin, 2000). However these beliefs are not yet fully supported by objective evidence. No investigations have objectively quantified changes in control of both head/trunk and upper extremity movements as a consequence of hippotherapy. The long term goal of this work is to demonstrate the effectiveness of hippotherapy (HPOT). The purpose of this study was to determine if HPOT can improve head/trunk stability and upper extremity function in children with spastic diplegia cerebral palsy.

Eleven children with spastic diplegia cerebral palsy (CP) and eight without disability (WD) were recruited for this study. They ranged from 5-13 years with GMFCS levels from I to IV. They had no recent surgeries, no recent use of antispasmodics and had no significant experience riding horses.

The children with CP participated in twelve weekly 45 min HPOT treatments directed by a licensed occupational or physical therapist. To measure dynamic stability of the trunk and head before and after the 12 wk HPOT intervention, each participant with CP had reflective markers placed on anatomical landmarks of the head and trunk. Each was tested on a motorized barrel using a six camera 3D video motion capture system in the laboratory. The testing barrel moved with one degree of freedom, 16cm amplitude at 1HZ. They were tested again after a 12 week washout period of no HPOT. The age matched group of children without disability was tested once to create a normative sample for comparison. To measure functional reaching, the participants sat on a stool and reached to touch a target on sagittal and coronal planes.

Dynamic Trunk/head stability was defined as the ability to keep the head and upper trunk relatively still while the pelvis is in rhythmic motion. Significant reductions in range of motion and movement variability demonstrated improvements in head control. Results also showed that anterior-posterior translation of the trunk and head decreased significantly demonstrating improved dynamic stability. Reach/Path ratio and speed to touch the target also improved significantly after HPOT. The significant changes on all three sets of variables were maintained 12 weeks after the intervention ceased.

Results supported the notion that the one translational degree of freedom barrel could be used in the laboratory environment to challenge and measure changes in head and trunk control. It appears that further use of this measurement model and development of additional systematic and objective data about the results of hippotherapy intervention will inform physicians, therapists and third party payers about hippotherapy as an effective treatment strategy for children with cerebral palsy.

HPOT appears to improve basic movement skills that are maintained after the intervention ceases. These skills may then be available to improve occupational performance and participation. The persistence of these positive changes when no longer receiving HPOT treatment suggests that the motor control improvements learned on a horse may become available as a foundation upon which to build improved functional skills in other aspects of life. Further investigation is needed to quantify these functional skills and occupational performance and participation improvements which are enabled by them.