Intervention To Advance Postural Transitions In Young Children With Neuromotor Disabilities And Resulting Effects On Trunk And Pelvic Movement

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Introduction

- Achieving independent sitting is a significant milestone in children because it is linked to greater success in reaching, object manipulation, and eye-hand coordination, which serves to advance learning (Soska, K. C. et al., 2010).
- Another important skill for independence and participation in community setting is the transition in and out of sitting (Harbourne K., et al., 2010).
- Although ambulation has been investigated extensively in this population, there is a puzzling lack of information on how transitional movement in and out of the sitting position develops, and how this transitional movement leads to self-mobility.

Purpose

The purpose of the study was:
1. To compare the efficacy of two interventions, Perceptual-Motor and Body Weight Support training, to advance early postural transitions to and from sitting in children with cerebral palsy (CP).
2. To determine changes in trunk and pelvis kinematics between the two intervention groups during a dynamic sitting task as a child changes from being a static sitter to being able to transition out of the sitting position.

Participants

- Twelve children with mild (N=5) and moderate (N=7) CP
- Mean age 18.09 months (SD 7.84)
- Inclusion Criteria: Diagnosed with CP; GMFCS I, II or III; independent sitting for at least 1 min: and ability to reach for an object.
- Exclusion Criteria: Other neuromotor disorders such as Down Syndrome, spina bifida; significant visual impairment, dislocated hip; pending orthopedic surgery which would interrupt the time period of intervention.

Methods

- Gross Motor Function Measure (GMFM) pre and post-intervention.
- Trunk and pelvis kinematics were analyzed by Basler 3-camera SIME Reality Motion (SIME Motion 2D/3D) with sampling frequency 60 Hz while sitting and reaching forward for a toy.
- Kinematic data was obtained at 0, 4, 8 and 12 weeks of intervention for both intervention groups.
- A customized MatLab program was used to calculate angular displacement, acceleration, and velocity for pelvis and thorax in sagittal plane.

Placement of Markers on the Trunk and Pelvis for the Kinematic Analysis

The triangulation of markers on the trunk and pelvis are used for measuring movement. The arrows indicate local movement vectors for the respective segments of the body (trunk and pelvis) used to determine movement around the x, y and z axes. Angular displacement, velocity, and acceleration are calculated based on these markers.

Intervention

A perceptual-motor approach emphasized on child-directed, self-initiated functional movement with therapist’s suggestions and cues for variability.

Body weight support training emphasized assisting the child by lifting the body segments (trunk, legs) and initiating successful (normal) patterns of movement. (Cherng, R.J., et al., 2007)

Results

Significant difference in GMFM sitting (p=0.02) and standing (p=0.04) scores between pre and post perceptual motor intervention.

Significant difference in GMFM sitting (p=0.04) and crawling (p=0.02) scores between pre and post body weight support intervention.

Change in Problem Solving Ability Between Perceptual Motor and Body Weight Support Training groups

The Early Problem Solving Indicator (EPSI) of Individual Growth and Development Index (IGDI) is a measure of infant’s cognitive skills. Perceptual Motor training group showed significant increase in scores on Explores and Functions components post-intervention compared to Body Weight Support Training group. It indicates that the Perceptual Motor training enhances the problem solving abilities (cognition), thus facilitates learning.

Conclusion

- Children in both groups made progress in sitting skills.
- Perceptual motor training group was more effective in advancing sitting transitions compared to Body Weight Support group.
- Perceptual motor training group showed more pelvis displacement in sagittal plane, which indicates ‘readiness’ for transition out of sitting position and independent mobility.
- Pelvis displacement may be a sensitive tool to detect advancement from static sitting to dynamic motor skills such as transitions in and out from sitting and crawling.

Clinical Implications For Intervention

- This study provides support for perceptual-motor intervention to improve transitions in and out from sitting position and independent mobility in children with CP.
- Self initiated, functionally directed movements with guidance and cues from therapist helps in improving problem solving.
- Both intervention strategies appeared to support the principle of specificity of practice. Practice in mobility improved skill in that area, and practice in postural transitions improved that skill area. In addition, practice in problem solving motor tasks appeared to improve problem solving in general, including a task considered to be in the cognitive realm.

References


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