

QUESTION: What is the most effective intervention for improving sitting postural control in infants (aged between 1 and 3) with or at high risk for cerebral palsy (CP)?

CLINICAL BOTTOM LINES

1. Targeting the task of sitting rather than frequency or method of intervention produces significant functional progress in the skill of sitting in infants with and at high risk of CP. This improvement is demonstrated by significant changes in the Gross Motor Function Measure (GMFM) sitting subscale of infants in both intervention groups; home program (family-focused) and perceptual-motor (child-focused).
2. Infants who received perceptual-motor intervention showed postural control behavior characteristics similar to typically developing infants compared to infants who received the home program based on analysis of linear and non-linear center of pressure (COP) variables. These characteristics are:
 - A) increased velocity of movement;
 - B) increased variability and decreased complexity of movement (i.e. maintaining predictability for weight shifts for postural control) in the anteroposterior (AP) direction
 - C) decreased variability and increased complexity of movement (i.e. increasing ability to keep the center of mass over the narrowing base of support) in the mediolateral (ML) direction
3. Linear and non-linear measures of COP are important measures for evaluating the development of postural control in functional and motor skill acquisition.

SUMMARY OF KEY EVIDENCE:

Study Design: Randomized longitudinal design

Sample: 35 infants with delays in sitting were recruited randomized into 2 groups, 30 completed the study: Perceptual Motor program (n=15); Home program (n=15) and 15 typically developed infants were also recruited as the reference group. The intervention groups had 6 infants at Gross Motor Function Classification Scale -GMFCS level IV, 5 infants at GMFCS level III, 3 infants at GMFCS level II and 15 infants at GMFCS level I. Fourteen (14) infants were categorized as “mild”, 8 as “moderate” and 8 as “severe” based on the Peabody Gross Motor Quotient standardized score.

Procedure: Pre-test at recruitment and post intervention measurements at 1 month and 3 months were taken for both intervention groups. Infants in the home program group (family-focused) received physical therapist guided care-giver intervention consisting of play, handling and positioning suggestions during daily routine activities. Therapists visited homes of participants once a week for 8 weeks. The perceptual-motor program (child-focused) consisted of 50 minutes of intervention based on self-initiated, goal directed movements for functional action and postural adaptation- concepts described by Tscharnuter (1993, 2002).

The intervention was provided by trained physical therapists, 2 times a week for 8 weeks. There was no intervention for reference group. Measurements for the reference group were taken at the beginning of sitting skill acquisition and 3 months later when sitting was independent.

Outcome measures: (A) Postural control measures using center of pressure (COP) data: linear measures; RMS AP and RMS ML [root mean square- anteroposterior (AP) and mediolateral (ML)] and Sway path (velocity) and non-linear measures; ApEn (Approximate entropy) AP and ML

(B) Gross Motor Function Measure- GMFM sitting subsection.

Results: Both intervention groups made significant functional progress in sitting. There was a main effect of time in the GMFM sitting subscale and for 2 COP variables: RMS ML ($F_{1, 42} = 15.547$, $p = 0.00$) and ApEn AP ($F_{1, 42} = 16.066$, $p = 0.00$) for both intervention groups. Analysis of sway path (velocity) indicated a significant group x time interaction. Post intervention scores showed that the perceptual-motor group increased in velocity beyond the levels of typically developing infants while the home program group decreased.

APPRAISAL AND APPLICATION:

The Joanna Briggs Institute Critical Appraisal Tool (2016) for cohort studies was used to assess the methodological quality and the possibility of bias in the design, conduct and analysis of the study.

Strengths:

- The level of sitting skill of infants at baseline for intervention groups and the reference group were similar and were measured in a valid and reliable way using the sitting subscale of the GMFM.
- Infants with or at risk for CP were assigned to two groups through randomization. The severity score based on the Peabody Gross Motor Quotient standardized score was not different between the two groups.
- Both interventions were clearly described to allow for replication. The frequency of visits and the amount of contact or interaction with child by the therapists during intervention sessions were reported. Differences in the characteristics between the two interventions were also clearly described and illustrated.
- Therapist trained in scoring GMFM scored a reliability greater than 90% agreement with training video tapes.
- Person selecting video segments for COP analysis was blinded to group assignments of infants receiving intervention thus reducing potential bias.
- The use of non-linear measures of COP provided additional fidelity to the description of postural control.
- Confounding factors, experience and skill of care-givers were identified.

Threats:

- Infants who dropped out or did not complete study were not described and were not included in statistical analysis.
- The frequency of visits by therapists and engagement in intervention activities was different in both groups. The amount of time children spent engaged in intervention in the home program could not be controlled.
- Identified confounding factors such as experience and skill of care-givers were not accounted for in the study design.

Application:

Even though the GMFM sitting subscale did not demonstrate statistically significant difference between the two intervention groups, analysis of COP variables indicated differences in the development of sitting postural control in terms of variability, velocity and structure (complexity) of COP.

Increase in variability and regularity(decreased complexity) of COP in the AP direction (RMS AP) as well as decrease in regularity (increased complexity) in the ML direction and increased velocity of movement were demonstrated as essential factors for the development sitting postural control in infants with and at risk for CP.

Further intervention studies incorporating these factors are needed to provide additional evidence for practice.

Citation:

Harbourne, R. T., Willett, S., Kyvelidou, A., Deffeyes, J., & Stergiou, N. (2010). A comparison of interventions for children with cerebral palsy to improve sitting postural control: a clinical trial. *Physical Therapy, 90*(12), 1881-1898. doi:10.2522/ptj.2010132

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