Functional Sitting Skill Development, Sitting Posture and the Relationship to Object Permanence in Infants with Motor Delays

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Background/Purpose

- Object Permanence is the ability to understand that objects continue to exist even when they cannot be observed.
- Object permanence, a cognitive construct, is grounded in infants’ everyday perceptual-motor experience, such as sitting and object interaction.1,2
- The development of sitting may also contribute to building cognition through object understanding.
- Adequate postural control in sitting allows infants to process visual information and use their hands freely to manipulate objects, which facilitates cognitive development.3
- It is not clear how sitting development relates to object permanence in infants with motor delays.
- The purpose of this study was to investigate the relationship of two factors: functional sitting skill development, measured by a standardized observational test, and sitting posture, measured by angular forward lean of the trunk in sitting.
- 25 infants with severe motor delays were assessed for gains in object permanence, angular trunk lean, and functional sitting between baseline and 3 months.

Methods

Participants

- Twenty-five infants with severe motor delays were recruited as part of a larger study (START-Play).
- Inclusion criteria:
  - > 1SD below mean for corrected age on motor domain of the Bayley Scales of Infant and Toddler Development
  - 7-16 months of corrected age
  - Ability to sit propping with their arms for at least 3 seconds but unable to get in and out of sitting (sitting emergence)
- Exclusion criteria: blindness, progressive disorder

Object Permanence Scale (OPS)

- Consists of 7 tasks extracted from developmental studies on object permanence.5
- Developed to measure object permanence from minimal to advanced skills, scaled from 0-10.
- During the test, infants sit on the floor or sit in a supportive chair depending on their ability to maintain a sitting position.

Analysis

- SPSS version 26 used
- Linear regression model with change scores in OPS = dependent variable
- Predictors=change in GMFMsit and change in AngleSit

Angles Video Goniometer © App

- The Angles Video Goniometer©5 application measures forward trunk incline when support released in sitting.
- Coder moved video to point where the infant stops falling forward after trunk release.
- The coder (95% reliability) measured the angle of the trunk to the legs at the lowest point.

Results

- A significant regression equation was found (F(2,22)=9.63, p<.001) with a R² of .467. However, only GMFMsit was a significant predictor of object permanence scores (t=4.03, p=0.001). See graphs
- Infants who progressed in functional sitting skills were able to perform better on the Object Permanence Scale regardless of “normal” posture as measured by AngleSit.

Conclusions

- Infant improvements in sitting skill, even though delayed developmentally and with adaptive postures, may contribute to advancing a cognitive skill such as understanding the permanent characteristics of objects.
- Advancement of object permanence may be related to sitting development, in addition to advances previously noted in self-mobility studies.

Clinical Relevance

- Physical therapists often focus on alignment of posture in both early sitting and standing, at the expense of allowing functional adaptations that can drive cognitive advancement.
- Therapists should understand that infants may be building cognitive constructs during the emergence of sitting function.
- Cognitive tasks should be embedded in tasks focused on building functional motor abilities.