

## BACKGROUND

- Object Permanence is the ability to understand that objects continue to exist even when they cannot be observed.
- Object permanence is fundamental to representing objects and an important cognitive construct that develops during early life.
- The construct of object permanence links to motor experience such as sitting and self-mobility.<sup>1-2</sup>
- Adequate postural control in sitting allows infants to process visual information and use their hands freely to manipulate objects, which facilitates cognitive development.<sup>3-4</sup>
- Infants with limited motor experience due to motor delays may be delayed in developing the object permanence construct.

### Purpose

- To compare the development of object permanence between infants with and without motor delay, by examining change on a scale of object permanence over 6 months.

### Participants

- Infants were recruited as part of two larger studies (START-Play and CHoR) at the onset of sitting emergence
  - Sitting emergence: infants were able to sit propped on their arms for at least 3 seconds but unable to get in and out of sitting
- 43 infants with motor delay (Mean age 10.3months)
  - Inclusion criteria: > 1SD below mean for corrected age on motor domain of the Bayley Scales of Infant and Toddler Development, 7-16 months of age
  - Exclusion criteria: Blindness, diagnosis of progressive disorder
- 29 typically developing infants (Mean age 5.3 months)
  - Inclusion criteria: no history of delay, preterm birth or significant health conditions, < 7 months of age

## METHODS

### Object Permanence Scale (OPS)

- Consists of 7 tasks extracted from developmental studies on object permanence.<sup>5-7</sup>
- Developed to measure object permanence from minimal to advanced skills, in which the child has an opportunity to earn a score (0-10).
- During the test, infants sit on the floor or sit in a supported chair depending on their ability to maintain a sitting position.

### Procedure

- The OPS was administered and videotaped 4 times over 6 months, at baseline, 1.5-month, 3-month and 6-month visits.
- Videos were scored independently by blinded assessors

Score	Behavior
0	Child does not look at object or follow object
1	Child looks at object in one location, then shifts gaze to new location to find object when object is moved
2	Child re-orient's body part other than head to gaze at moved object when object shifted in space
3	Child re-orient's body posture to follow moved out of view (e.g., looking over edge of tray in high chair when toy dropped)
4	Looks inside of wide container and attempts to retrieve toy dropped inside
5	Pulls cloth off interesting toy after watching cloth being placed and toy partially visible
6	Pulls cloth off toy after watching toy being slid under cloth
7	Pulls cloth off interesting toy after watching cloth being placed and toy completely covered, with identical cloth nearby
8	Finds a toy hidden under one of two cups
9	Find a toy hidden under one of two cups when the cups are reversed after the toy is hidden
10	Double visual displacement used as a toy is hidden under one cup, removed and hidden a second time under the second cup

## RESULTS

- Results of a mixed analysis of variance (Figure 1)
  - Main effect for time ( $F(3, 210) = 20.48, p < 0.001$ ),
  - No between group difference ( $F(1, 70) = 0.43, p = 0.52$ )
  - No interaction between group and time ( $F(3, 210) = 2.53, p = 0.06$ ).
- The mean score on the OPS increased over time in both groups, but did not differ between groups.
- But, mean age at baseline was significantly older in infants with motor delay than typically developing infants ( $p < 0.001$ ), indicating delayed development of object permanence by age, but coinciding with sitting emergence.

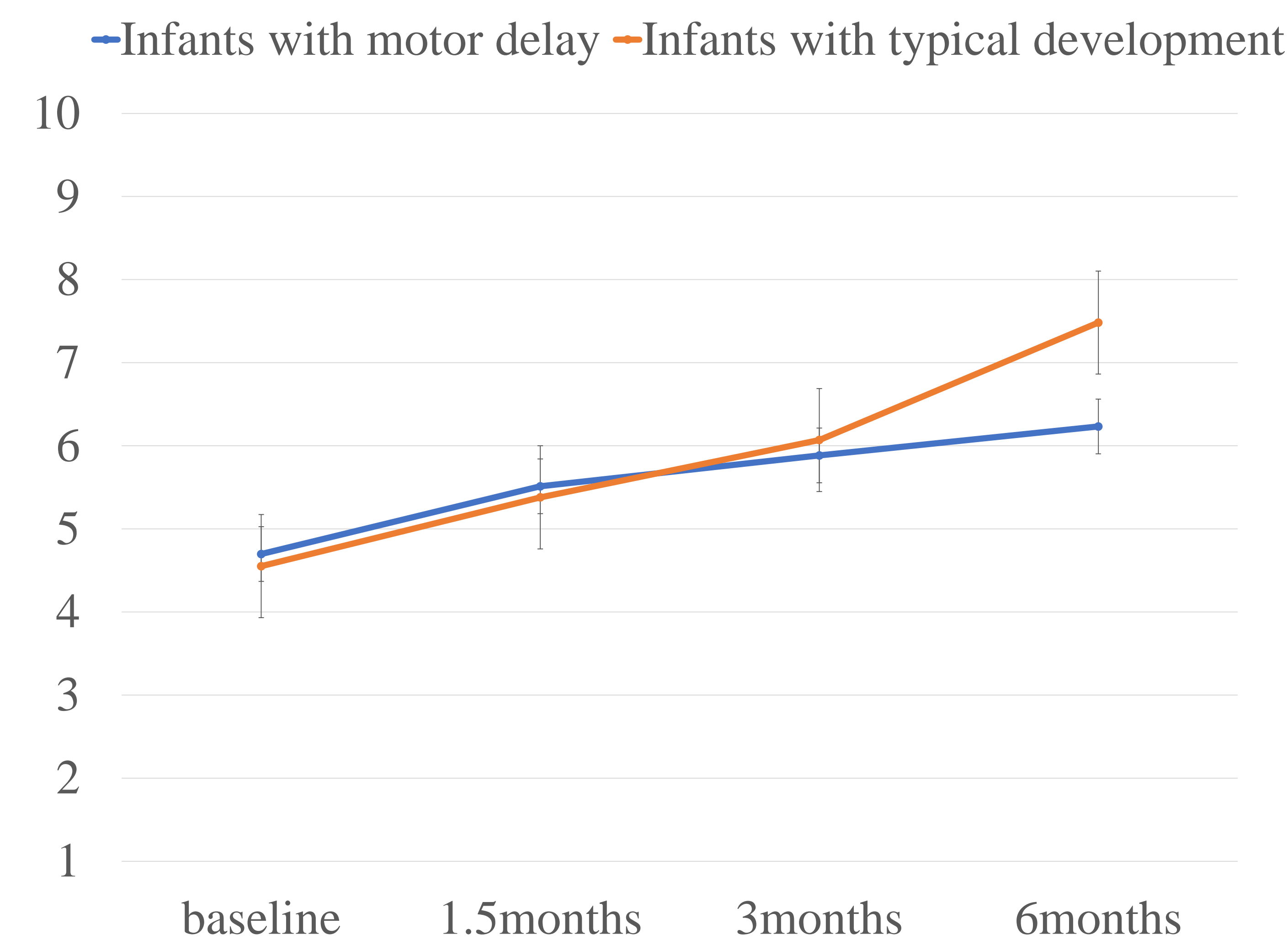


Figure 1. Change in object permanence scores over 6 months  
Bars represent standard errors of the mean

## CONCLUSIONS

- Infants with motor delay demonstrated delayed development of object permanence, as measured by the object permanence scale (OPS).
- Although infants with motor delay were approximately 5 months older than typically developing infants, their performance on the OPS was similar to typically developing infants at the onset of sitting.
- Progression of object permanence continued over 6 months for both groups, but the slope of progression in infants with motor delay tended to be less.
- Interventionists targeting early motor skills should track the progression of cognitive skills such as the object permanence construct, which may be closely related to change in motor skill.

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