THE RELATIONSHIP BETWEEN DEVELOPING SITTING POSTURAL CONTROL AND OBJECT PERMANENCE IN INFANTS WITH NEUROMOTOR DISORDERS

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BACKGROUND
- Object permanence is an important cognitive construct that develops during early life
- Object permanence is the ability to understand and remember that objects or people continue to exist even when they cannot be observed or sensed in any way
- The construct of object permanence links to motor skill development and contributes to building understanding of object properties
- The purpose of this study was to examine the change in object permanence skill over time as sitting skills advanced, in infants with neuromotor delays

Participants
- Nineteen infants receiving early intervention services for motor delay
- Recruited as part of a larger START-Play study
- Mean age at entry = 11.8 mo, SD = 3 mo
- Exclusion criteria: Blindness, diagnosis of cognitive Bayley, or presence of different characteristics of objects

METHODS

START-Play Scale for Object Permanence

<table>
<thead>
<tr>
<th>Score</th>
<th>Behavior</th>
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<tbody>
<tr>
<td>0</td>
<td>Child does not look at or follow object</td>
</tr>
<tr>
<td>1</td>
<td>Child looks at object in one location, then shifts gaze 45° to find object when object is moved</td>
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<tr>
<td>2</td>
<td>Child re-orient body to gaze at moved object when object shifted in space</td>
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<tr>
<td>3</td>
<td>Child re-orient body posture to follow toy moved out of view (Example: looking over edge of tray in high chair when toy dropped)</td>
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<tr>
<td>4</td>
<td>Looks inside of wide container and attempts to retrieve toy dropped inside</td>
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<tr>
<td>5</td>
<td>Pulls cloth off interesting toy after watching toy being placed and toy appears visible</td>
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<tr>
<td>6</td>
<td>Pulls cloth off after watching toy being slid under cloth</td>
</tr>
<tr>
<td>7</td>
<td>Pulls cloth off interesting toy after watching toy being placed, with identical cloth nearby</td>
</tr>
<tr>
<td>8</td>
<td><em>Finds a toy hidden under one of two cups (item 40 in cognitive Bayley)</em></td>
</tr>
<tr>
<td>9</td>
<td><em>Finds a toy hidden under one of two cups when the cups are reversed after the toy is hidden (item 45 in cognitive Bayley)</em></td>
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<tr>
<td>10</td>
<td><em>Double visual displacement used as a toy is hidden under one cup, removed and hidden a second time under the second cup (item 50 in cognitive Bayley)</em></td>
</tr>
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<td><em>Taken from studies of early learning memory, recommended as predictors of later executive function.</em></td>
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</table>

Procedure
- Object permanence test done with sitting support as needed
- Sitting control measured using 3 trials, averaged within a session
- Videos of object permanence testing and sitting control recorded at baseline and after 3 months in home setting
- Videos of sitting and object permanence scored by blinded coders off site

RESULTS

Sitting Posture Improved
- Repeated measures from baseline to 3 months post-baseline showed a significant change over time (p=0.004)
- Sitting changed from leaning forward (mean=67°) to (mean=78°)

Object Permanence
- Repeated measures from baseline to 3 months post-baseline showed a significant change over time (p=0.022)
- OP scaled scores changed from a mean of 5 to a mean of 7

Infants sitting arms free
- Infants passing item #24 on GMFM (sits at least 3 seconds of arms free) scored significantly higher on the object permanence scale than infants with less functional sitting skill (p=0.01)

CONCLUSIONS
- Improvements in sitting skill, even though delayed developmentally, 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
- Therapists should understand that infants may be building specific cognitive constructs during the emergence of sitting
- Cognitive tasks should be embedded in tasks focused on motor skill building

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References
4. Nathaniel Joseph Cochran 2017; nathanchrzan.info

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Participants
- Nineteen infants receiving early intervention services for motor delay
- Recruited as part of a larger START-Play study
- Mean age at entry = 11.8 mo, SD = 3 mo
- Inclusion criteria: >1SD below mean for corrected age on motor Bayley and ability to prop sit for at least 3 seconds
- Exclusion criteria: Blindness, diagnosis of progressive disorder, ability to transition in and out of sitting

*Start-Play Consortium http://start-play.unl.edu/