## Supplemental Table 1. Evidence for Occupational Therapy Interventions to Improve Cognitive Development

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<tr>
<th>Author</th>
<th>Study Objectives</th>
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<th>Intervention and Outcome Measures</th>
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| Barrera, Kitching, Cunningham, Douchet, & Rosenbaum (1991) | To determine the long-term effectiveness of an early intervention program for participants with high- and low-birthweight preterm infants. | Level I RCT  
\[N = 67 \text{ preterm and full-term children (follow-up at age 5 yr)}\] | Intervention  
The initial study included 3 in-home groups: developmental programming intervention, parent-child intervention, and control group.  
Outcome Measures  
Various, including Minnesota Child Developmental Inventory | Some significant differences were noted, but not in the cognitive area.  
Children with very low birthweight scored lower in the cognitive area compared with other groups. | McCarthy Scale may underestimate developmental functioning.  
Study had small sample size. |
| Brooks-Gunn, Liaw, & Klebanov (1992) | To implement the Infant Health and Development Program in a low-birthweight population through a center-based program focusing on cognitive functioning. | Level I RCT  
\[N = 985 \text{ low-birthweight preterm infants}\]  
Intervention group \(n = 377\)  
Control group \(n = 608\) | Intervention  
Intervention included home visits (weekly during Year 1 and biweekly during Years 2 and 3), child care at a child developmental center, and parent group meetings.  
Outcome Measures  
- BSID  
- Stanford-Binet Intelligence Scale  
- Peabody Picture Vocabulary Test–Revised  
- Visual Motor Integration Test | Significant effects seen at 24 and 36 mo in cognitive domains.  
No significant differences were found for the BSID Motor Scale. | Patterns in ethnicity and level of education may skew results.  
Results cannot be generalized. |
| Gulsrud, Kasari, Freeman, & Paparella (2007) | To examine the effect of intervention on affect, gaze, joint attention, behaviors, and verbalizations in children diagnosed with ASD. | Level I RCT  
\[N = 35 \text{ children (ages 33–54 mo) diagnosed with autism}\]  
Joint attention group \(n = 17\)  
Symbolic play group \(n = 18\) | Intervention  
Joint attention and symbolic play interventions  
Outcome Measures  
Eye gaze, affect, nonverbal gestures, verbalization | Children in the joint attention intervention improved in acknowledgment of novel objects. | Study had small sample size with few diverse participants. |
| Kleberg, Westrup, Stjernqvist, & Lagercrantz (2002) | To examine the effect of NIDCAP on the 1-yr development of infants born with a gestational age of ≤32 wk. | Level I RCT  
\[N = 20 \text{ premature infants}\]  
NIDCAP group \(n = 11\)  
Control group \(n = 9\) | Intervention  
Intervention group received care in the NICU according to the NIDCAP. Follow-up was done at 12 mo adjusted age.  
Outcome Measure  
BSID | Cognitive development was significantly higher for experimental group; no significant difference was found on the Psychomotor Developmental Index. | Study had small sample size.  
NIDCAP program is a multidisciplinary dependent program with complex interventions (e.g., education, physical modifications).  
Higher proportion of girls was in control group. |
| Maguire et al. (2009) | To investigate the effect of NIDCAP on growth and cognitive, psychomotor, and neurodevelopment at | Level I RCT | Intervention  
Intervention group received care in the NICU according to the NIDCAP.  
Outcome Measure  
No statistically significant differences found between groups at 1- or 2-yr follow-up. | Intervention and control group infants were cared for in the same unit, so there may have been contamination in care. | |

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<td>McCormick et al. (2006)</td>
<td>To determine whether differences such as IQ and achievement would be observed in the Infant Health and Development Program, especially in the heavier low birthweight group, at 18-yr follow-up.</td>
<td>Level I RCT</td>
<td>Follow-up occurred at 1 and 2 yr corrected age.</td>
<td>Experimental group had higher scores on the PPVT and in math achievement. Scores on the cognitive testing approached significance.</td>
<td>Intervention period was shorter than most NIDCAP programs. Sample too small to achieve statistical significance in adverse outcomes. Low response rate at follow-up. Sample was not disadvantaged, so it was more difficult to detect differences in some areas.</td>
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<td>Melnyk et al. (2001)</td>
<td>To evaluate the effectiveness of a parent-focused intervention program, Creating Opportunities for Parent Empowerment (COPE), on infant cognitive development and maternal coping.</td>
<td>Level I RCT</td>
<td>Experimental group had significantly higher cognitive scores at 3 and 6 mo corrected age.</td>
<td>Experimental group had higher scores on the PPVT and in math achievement. Scores on the cognitive testing approached significance.</td>
<td>Limitations included small sample size; BSID II being used for purposes other than accurate prediction of normal IQs; and use of the Parental Beliefs Scale (baby subscale), which has low internal consistency reliability.</td>
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<td>Nelson et al. (2001)</td>
<td>To evaluate the effects of CNS injury by comparing infants who had experienced either intraventricular hemorrhage or periventricular leukomalacia with extremely premature infants who did not experience CNS injury. The researchers also compared infants who received auditory-tactile-visual-vestibular intervention with those who did not.</td>
<td>Level I RCT</td>
<td>No statistically significant differences found between groups; however, the experimental group had better motor and mental performance and had fewer cerebral palsy diagnoses at 1 yr. Infants with periventricular leukomalacia had significantly poorer mental development despite the group assignment.</td>
<td>Study had small sample size and lack of randomization associated with post hoc reconfiguration of groups based on type of brain injury. Length of intervention may have been too short to overcome serious neurodevelopmental disorders.</td>
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### Supplemental Table 1. Evidence for Occupational Therapy Interventions to Improve Cognitive Development (cont.)

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<td>Olafsen et al. (2006)</td>
<td>To evaluate the effects of optimized neonatal mother–infant transactions on joint attention at 12 mo and to analyze whether an early intervention program to increase parents' sensitivity to infants' behaviors enhanced joint attention at 12 mo.</td>
<td>Level I RCT, N = 140 preterm infants, 75 term infants. Intervention group n = 71 (36 boys, 35 girls); M gestational age = 30 wk. Control group n = 69 (37 boys, 32 girls); M gestational age = 30 wk. Term infants n = 75 (40 boys, 35 girls); M gestational age = 39 wk.</td>
<td>Intervention: The Vermont Intervention Program for Low Birth Weight Infants (Rauh, Achenbach, Nurcombe, Howell, &amp; Teti, 1988), which emphasizes transition: parents appreciating their baby's specific behaviors and being sensitive to the infant's cues and teaching parents to respond to cues. Neonatal nurses met with the parents every day for 7 days before discharge. They made 4 home visits after discharge.</td>
<td>Preterm intervention group was significantly higher in initiating joint attention and responding to social interaction. Term group scored moderately higher than the preterm control group. Infants did not show differences in responding to joint attention or responding to requests. Children's ability to integrate complex information may not be affected by this intervention.</td>
<td>Limited applicability to occupational therapists. Limited description of the intervention provided in the report.</td>
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<td>Orton, Spittle, Doyle, Anderson, &amp; Boyd (2009)</td>
<td>To examine the effects of early developmental intervention after discharge from the hospital on motor and cognitive development in preterm infants.</td>
<td>Level I Systematic review. Participants of each included study were infants born at &lt;37 wk gestational age with no major congenital abnormalities. 17 studies examined outcomes in infancy and school age; 11 were included in the meta-analysis.</td>
<td>Intervention: Infant interventions to improve cognitive or motor outcomes were performed in the hospital, home, or community center. Goals targeted parent–infant relationships and infant development.</td>
<td>Early developmental interventions improved cognitive outcomes in infancy and at preschool age. The results were not sustained at school age. Early intervention had little effect on motor outcomes. Benefits of developmental intervention may be restricted to short-term gains in cognitive outcomes.</td>
<td>Outcomes compiled were diverse; of 17 studies, only 9 had data analysis sufficient to include in the meta-analysis.</td>
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<td>Resnick, Armstrong, &amp; Carter (1988)</td>
<td>To develop a preventative model of care for premature infants (under 1,800 g) and compare it with a traditional remedial method.</td>
<td>Level I RCT, N = 41 premature infants. Experimental group n = 21. Control group n = 20.</td>
<td>Intervention: Preventative model vs. traditional remedial model. Preventative model included daily intervention in the NICU and twice monthly intervention in a home developmental program. Traditional remedial model included referral to intervention agencies, if needed, at 6-mo follow-up.</td>
<td>Statistically significant differences between groups on the BSID (Mental Development Index) found at 12 mo but not at 6 mo. No significant difference between groups on the Psychomotor Developmental index at 6- or 12-mo assessment.</td>
<td>Study had a small sample size of 41. Control for various interventions was not established, so it was difficult to identify specific interventions that were most effective.</td>
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<td>Whalen, Schreibman, &amp; Ingersoll (2006)</td>
<td>To examine collateral changes in social initiations, positive affect, play, imitation, and language in children with ASD after participation in a joint attention training program</td>
<td>Level IV</td>
<td>Intervention The joint attention treatment used naturalistic behavior modification techniques that included discrete trial training and pivotal response training. The child was taught to respond to joint attention bids, then was taught to initiate joint attention bids. <strong>Outcome Measures</strong> • BSID • Greenspan–Lieberman Observation Scale</td>
<td>The 4 participants showed increases in social initiations and positive affect at posttreatment; 3 improved in empathic response. All improved on the Structured Play Assessment. Imitation increased an average of 20%. No changes in the rate of functional or symbolic play were found. Improved joint attention may lead to increased attention to social stimuli.</td>
<td>Study had small sample size. No standardized assessments were used.</td>
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<td>Wong, Kasari, Freeman, &amp; Paparella (2007)</td>
<td>To determine the effectiveness of symbolic play skills vs. joint attention skills for children diagnosed with autism.</td>
<td>Level 1</td>
<td>Intervention Joint attention and symbolic play interventions with applied behavior analysis were first taught at a table, then generalization was attempted on the floor. <strong>Outcome Measures</strong> • Mullen Scales of Early Learning • Structured Play Assessment • Early Social Communication Skills Assessment</td>
<td>Results were inconclusive and dependent on many factors. In general, children with autism mastered criteria at table before generalizing skills in floor play.</td>
<td>Study had small sample size with few diverse participants. Significant language differences existed between groups.</td>
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**Note:** ASD = autism spectrum disorder; BSID = Bayley Scales of Infant and Toddler Development; CNS = central nervous system; NICU = neonatal intensive care unit; NIDCAP = Newborn Individualized Developmental Care and Assessment Program; RCT = randomized controlled trial.

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