improved tailoring of interventions for this population.

Categories: Prenatal/Perinatal Factors/Prematurity
Keyword 1: fetal alcohol syndrome
Keyword 2: cognitive functioning
Keyword 3: subcortical
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2 Choline as a neurodevelopmental intervention for children with fetal alcohol spectrum disorder: Long-term associations with white matter microstructure and executive function

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Objective: Fetal alcohol spectrum disorder (FASD) is a life-long condition, and few interventions have been developed to improve the neurodevelopmental course in this population. Early interventions targeting core neurocognitive deficits have the potential to confer long-term neurodevelopmental benefits. Time-targeted choline supplementation is one such intervention that has been shown to provide neurodevelopmental benefits that emerge with age during childhood. We present a long-term follow-up study evaluating the neurodevelopmental effects of early choline supplementation in children with FASD approximately 7 years on average after an initial efficacy trial. In this study, we examine treatment group differences in executive function (EF) outcomes and diffusion MRI of the corpus callosum using the Neurite Orientation Dispersion and Density Index (NODDI) biophysical model.
Participants and Methods: The initial study was a randomized, double-blind, placebo-controlled trial of choline vs. placebo in 2.5- to 5-year-olds with FASD. Participants in this long-term follow-up study included 18 children (9 placebo; 9 choline) seen 7 years on average following initial trial completion. The mean age at follow-up was 11 years old. Diagnoses were 28% fetal alcohol syndrome (FAS), 28% partial FAS, and 44% alcohol-related neurodevelopmental disorder. The follow-up evaluation included measures of executive functioning (WISC-V Picture Span and Digit Span; DKEFS subtests) and diffusion MRI (NODDI).
Results: Children who received choline early in development outperformed those in the placebo group across a majority of EF tasks at long-term follow-up (effect sizes ranged from -0.09 to 1.27). Children in the choline group demonstrated significantly better performance on several tasks of lower-order executive function skills (i.e., DKEFS Color Naming [Cohen's *d* = 1.27], DKEFS Word Reading [Cohen's *d* = 1.13]) and showed potentially better white matter microstructure organization (as indicated by lower orientation dispersion; Cohen's *d* = -1.26) in the splenium of the corpus callosum compared to the placebo group. In addition, when collapsing across treatment groups, higher white matter microstructural organization was associated with better performance on several EF tasks (WISC-V Digit Span; DKEFS Number Sequencing and DKEFS Word Reading).
Conclusions: These findings highlight long-term benefits of choline as a neurodevelopmental intervention for FASD and suggest that changes in white matter organization may represent an important target of choline in this population. Unique to this study is the use of contemporary biophysical modeling of diffusion MRI data in youth with FASD. Findings suggest this neuroimaging approach may be particularly useful for identifying subtle white matter differences in FASD as well as neurobiological responses to early intervention associated with important cognitive functions.

Categories: Prenatal/Perinatal Factors/Prematurity
Keyword 1: fetal alcohol syndrome
Keyword 2: corpus callosum
Keyword 3: executive functions

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3 Relationships between Motor Skills and Executive Functions in Preterm-Born Preschoolers

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Objective: Motor skills have been linked to executive functions (EFs) in typically developing school-, and preschool-age children. Yet fine motor skills have been more consistently correlated with EFs than gross motor skills, perhaps because they are more frequently investigated. Preterm born children are vulnerable to deficits in both gross and fine motor skills, even after exclusion of neurological cases. In addition to motor skills, EFs may also be compromised in preterm born preschoolers. Because premature birth increases the odds for atypical brain development, and since adverse effects on brain functioning tend to yield increased dispersion of performance scores, we wished to determine whether fine and gross motor skills are differentially linked to performance on tasks measuring EF skills in nonhandicapped preschoolers born preterm.
Participants and Methods: We studied 99 preterm (born < 34 weeks) singleton preschoolers (3-4 years of age; 50 females), all graduates of the Neonatal Intensive Care Unit at William Beaumont Hospital, Royal Oak, MI. Motor skills were assessed with the Peabody Developmental Motor Scales – (Second Edition) which provide Fine and Gross Motor Quotients (FMQ, and GMQ, respectively). Three core EFs were measured: working memory, motor inhibition, and verbal fluency. Working memory skills were assessed with two Clinical Evaluation of Language Fundamentals – Preschool – Second Edition subtests: Recalling Sentences (RS) and Concepts and Following Directions (CFD). Motor inhibition and verbal fluency were assessed with the NEPSY-II Statue and Word Generation (WG) subtests, respectively. Children with a history of moderate to severe intracranial pathology or cerebral palsy were excluded.
Results: We conducted linear regression analyses using scaled scores from the Statue, WG, RS, and CFD subtests as the predicted variables. Predictors of interest were the FMQ and GMQ. We adjusted for sociodemographic factors (SES and sex) and perinatal risk (gestational age, sum of antenatal complications and birth weight SD). The GMQ was significantly associated with all four EF measures (Statue, $t(84) = 4.13$, $p < .001$; CFD, $t(92) = 3.83$, $p < .001$; WG, $t(84) = 3.38$, $p = .001$; RS, $t(90) = 3.37$, $p = .001$). The FMQ was significantly associated with three of four EF measures (Statue, $t(84) = 3.41$, $p = .001$; CFD, $t(92) = 3.97$, $p < .001$; WG, $t(84) = 1.96$, $p = .054$; RS, $t(90) = 2.91$, $p = .005$).
Conclusions: Both fine and gross motor skills were associated with EF in nonhandicapped preterm-born singletons. Lower motor functioning in either motor domain was linked to reduction in performance on diverse EF measures. It should be emphasized that motor performance contributed to explaining variance in EFs even after statistical adjustment for early medical risk. In addition to the obvious conclusion that motor skills may underpin EF skills, it is likely that early risk factors not captured by the medical risk variables used in our analyses were nonetheless tapped by variability in motor performance. As preschool EFs are essential for subsequent academic performance, the significance of age-appropriate motor development in the preschool age should not be underestimated in our at-risk population.

Categories: Prenatal/Perinatal Factors/Prematurity
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Keyword 2: motor function
Keyword 3: child development disorders
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4 Severity of Retinopathy of Prematurity and Motor Skills Development in Preschoolers

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