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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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