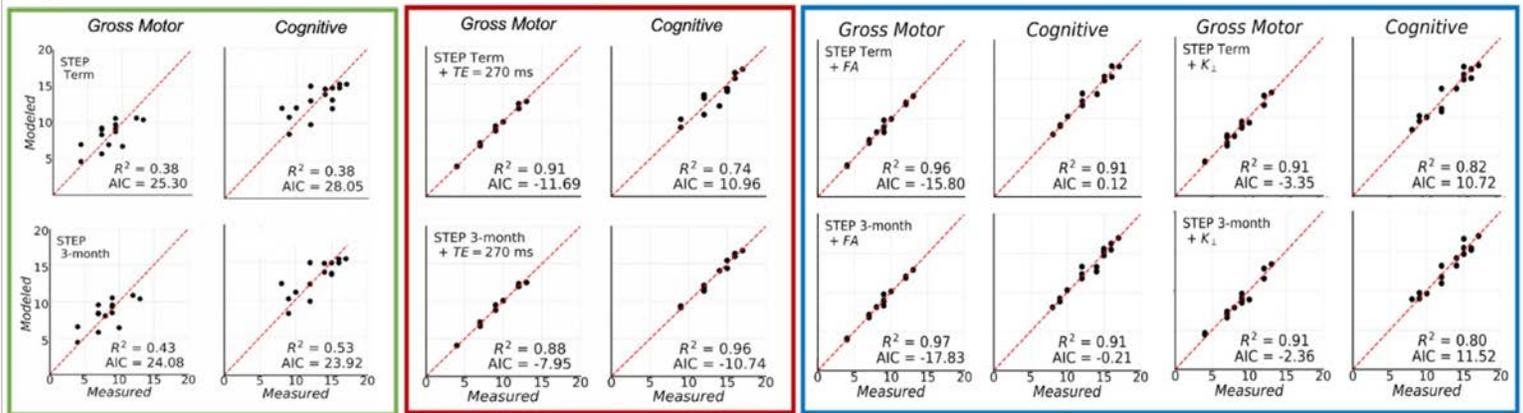
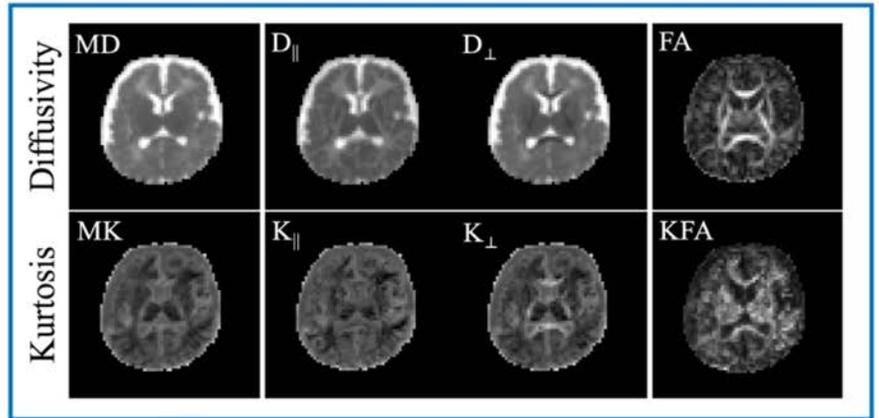
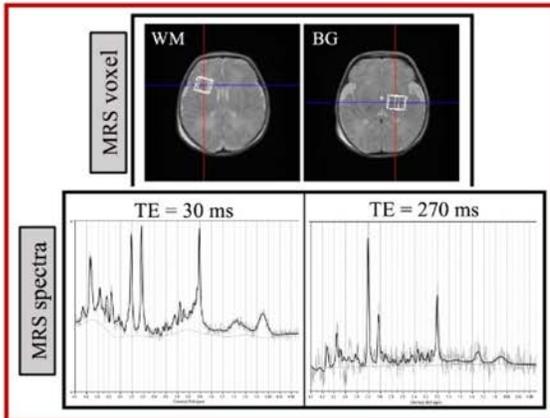


# CBI's Image of the Month

May, 2021

Courtesy of Dr. Jenkins Lab , Department of Pediatrics



**Metabolic and diffusion imaging in preterm infants adds to performance an early functional motor test (the STEP) to predict motor and cognitive developmental outcomes at 12 months.**

Top red: MR spectroscopy (MRS) at term age equivalent in preterm infants adds to predictive models of future developmental outcomes. MRS voxel placement within the right frontal WM near the watershed region and in the left basal ganglia (BG) on an axial T2-weighted anatomical MR image from a neonatal brain and representative processed LCMoDeL spectra for echo times (TE) of 30 and 270 ms. Bottom green: 12-month Bayley-III gross motor and cognitive score predictions using the STEP development assessment at term and 3-months of age only. Bottom red: Predictive models were improved when STEP scores were combined with MRS components from TE = 270 ms in frontal WM and BG,  $[NAA/Cr + NAA/Cho + Cho/Cr]_{WM} + [NAA/Cr + NAA/Cho + Cho/Cr]_{BG}$ . NAA, N-acetyl cysteine; Cho, choline and Cr, creatine. Top blue: DKI and DTI in preterm infants add different information to a predictive model of future developmental outcomes. An axial slice from a representative neonatal subject shows rotationally invariant tensor quantities calculated from a diffusional kurtosis imaging (DKI) analysis: mean, axial and radial diffusivity and fractional anisotropy (MD,  $D_{\parallel}$ ,  $D_{\perp}$  and FA) and corresponding kurtosis metrics (MK,  $K_{\parallel}$ ,  $K_{\perp}$  and KFA). Diffusivity quantifies the degree of water mobility while kurtosis is a measure of complexity of water diffusion within the tissue microenvironment. Kurtosis provides more detail in sparsely myelinated infant brain. The MD,  $D_{\parallel}$ , and  $D_{\perp}$  have units of  $\mu m^2/ms$  with the remaining metrics being unitless. Bottom blue: FA and  $K_{\perp}$  from various white matter ROIs combined with STEP scores also improved gross motor and cognitive predictions at 12-months over STEP alone (green box). All models were corrected for gestational age were selected using adjusted- $R^2$  in a stepwise multiple linear regression model.